ICMJ

AUSTRALIAN INTERCOLLEGIATE MEAT JUDGING ASSOCIATION

Australian Intercollegiate Meat Judging

Guide to evaluation of beef, lamb and pork

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1.0 Introduction

1.1 What is the Australian ICMJ competition?

The Australian Intercollegiate Meat Judging (ICMJ) Association is an organisation aimed at exposing and encouraging secondary and tertiary students into careers in the meat industry. The Association has been established and competitions held annually since 1990.

The objective of ICMJ is to provide an opportunity for students to learn and to build the pool of intelligent young meat industry representatives, fired with enthusiasm who will give the Australian meat industry the expertise and drive to compete in the meat quality world of the future.

In order to foster these interests, the Association provides opportunities for students through the coaching and development of knowledge of meat appraisal and evaluation. To reward this interest, a contest is held annually to allow students to promote their knowledge.

The competition involves students competing against other Universities and colleges to potentially reap rewards for themselves and their educational institution through prizes and career opportunities.
Through involvement in the ICMJ competition, students can be assured of expanding their knowledge of meat quality and evaluation techniques which are considered invaluable skills in this associated industry.

For more information about ICMJ or to keep updated with ICMJ activities, visit www.icmj.com.au

1.2 Objective

1. To foster the interest and career aspirations of students in the meat and livestock industries
2. To provide tertiary students with the knowledge of meat attributes required to accurately evaluate beef, lamb and pork carcases and primals in accordance with customer requirements for each of these categories.

1.3 Learning outcomes

The learning outcomes of the ICMJ competition, through coaching, tutoring and competing include:

- An understanding of customer specifications with regards to quality, trimness/leanness and muscularity.
- An understanding of meat quality attributes of beef, lamb and pork carcases and primals
- An understanding of how carcase attributes influence eating quality
- An understanding of how to assess meat quality attributes
- An understanding of how to assess trimness/leanness of a carcase and primal
- An understanding of how to assess muscularity of a carcase and primal
- The ability to accurately identify retail cuts and wholesale primals
- The ability to accurately identify the major points and features of a carcase
- The ability to use the information provided to evaluate a range of provided products
- The ability to accurately answer specified questions about a range of provided products

How to use this training manual

This training manual is intended to be used as reference prior to and during training where necessary.

IT IS NOT INTENDED TO REPLACE THE INTERACTIVE GUIDE TO MEAT JUDGING

The interactive virtual program contains practice judging classes and revision activities. It is recommended all students are familiar with the content of the program.

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AUSTRALIAN INTERCOLLEGIATE MEAT JUDGING ASSOCIATION

2.0 Beef evaluation

Carcases and primals

2.1 Beef carcase evaluation

There are three broad attributes of a carcase that contribute to its suitability to a given market specification or to a customer's expectation. These are grouped as:

- Eating Quality
- Yield – Trimness and muscling

When evaluating carcases according to the above factors, it is important to consider the customer that the carcase will be supplied to. Market specifications are determined by the customer and hence carcases should be produced and evaluated to ensure conformance to the specifications.

There is not any one carcase trait that makes an ideal product. When evaluating carcases, the above attributes should be considered independently and then combined to produce an overall evaluation outcome.

2.2 Beef carcase quality

Quality is defined as 'fitness for purpose' indicating that quality can be interpreted as many various things depending on the purpose or end use of the carcase.

For example – Food service outlets may consider marbling to be an important quality attribute of beef whereas a retail butcher may consider fat colour an important quality attribute.

The following attributes can have impact on beef carcase quality and its 'fitness for purpose':

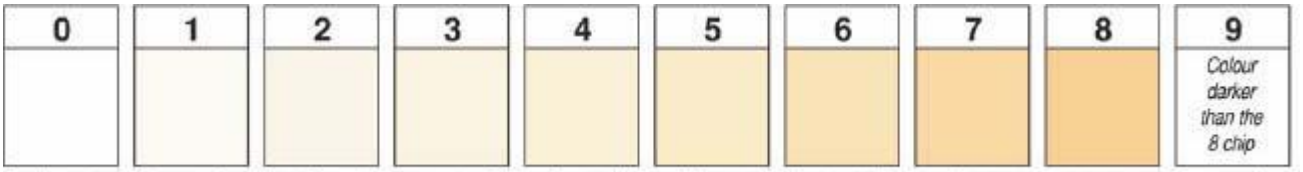
- Meat colour
- Marbling
- Ossification
- Fat colour
- Carcase defects e.g. blood splash (Ecchymosis)

2.2.1 Fat colour

Fat colour is the colour of intermuscular fat lateral to the rib eye muscle. It is assessed on the chilled carcase and scored against the AUS-MEAT Fat Colour Reference Standards. Fat colour is assessed by comparing the intermuscular fat colour lateral to the M. longissimus dorsi and adjacent to the M. iliocostalis with the reference standards. Where a fat colour score falls between two of the reference standards, the number corresponding to the more yellow of the reference standard is assigned to the carcase.

Fat colour does not impact on eating quality or conformance to Meat Standards Australia requirements but it can affect the saleability of the carcase due to market specifications. Consumer surveys have shown that yellow fat colour has a lower eye appeal at the retail level.

AUS-MEAT Fat Colour Reference Standards



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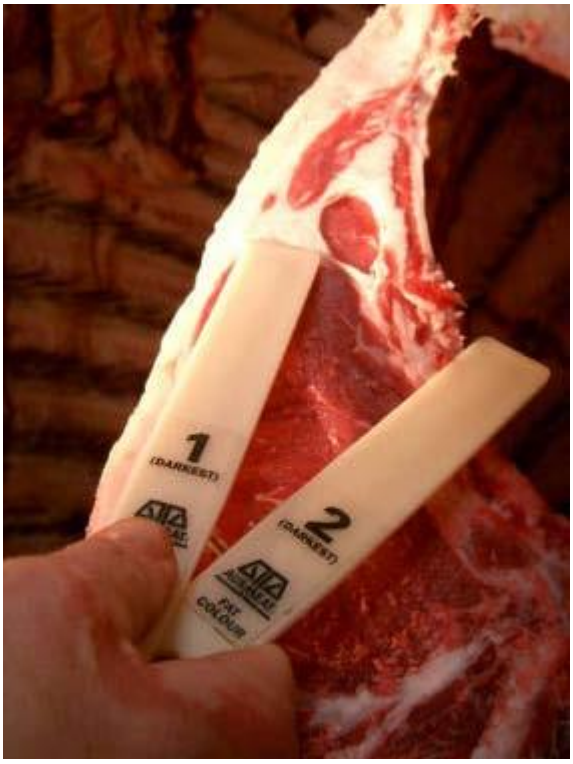


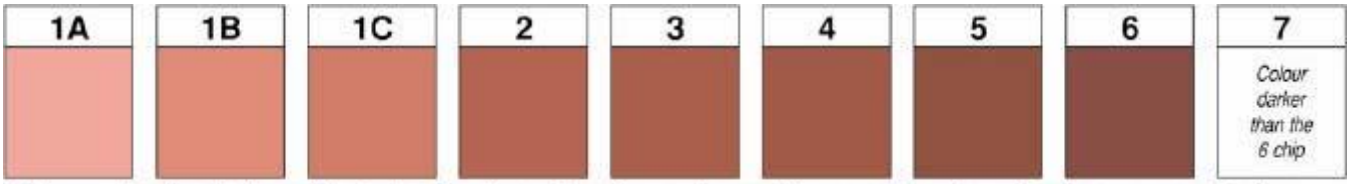
2.2.2 Meat colour

Meat colour is assessed at the rib eye muscle (longissimus dorsi) at the quartering site. It is assessed on the chilled carcase and scored against the AUS-MEAT Meat Colour Reference Standards in the area of the M. longissimus that displays the most predominant colour.

Where there is no clearly predominant colour, the darkest significant colour is assessed and scored accordingly. Where a meat colour score falls between two of the Reference Standards, the number corresponding to the darker of the Reference Standards is assigned to the carcase.

Meat colour has a scale of 0 –7. Consumers have shown preference for bright cherry red meat colour when purchasing at the retail level. Meat colour is often used by processing companies as specification on their livestock grid.

AUS-MEAT Meat Colour Reference Standards



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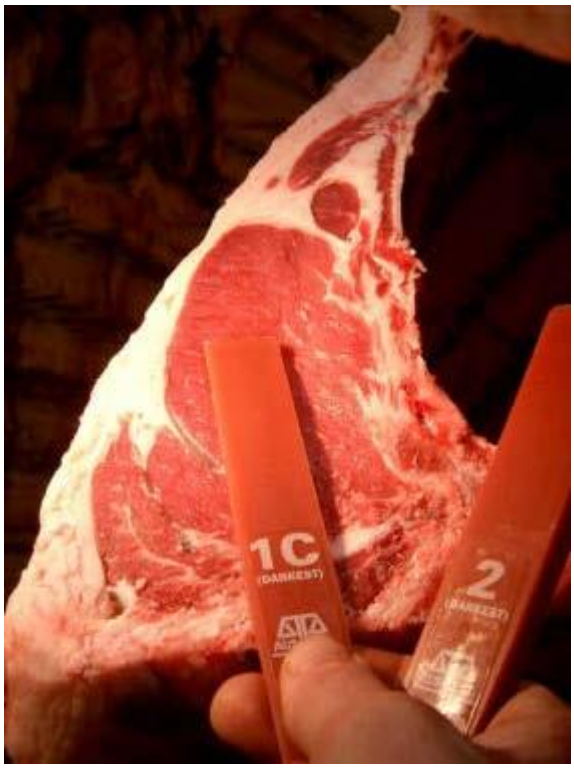


Dark cutting

Meat colour above the AUSMEAT Standard of 3 may be classified as 'dark cutting' by processing companies. Dark meat colour can be attributed to pre-slaughter stress in the live animal and the depletion of glycogen reserves in the live animal. Stress can be in the form of the following:

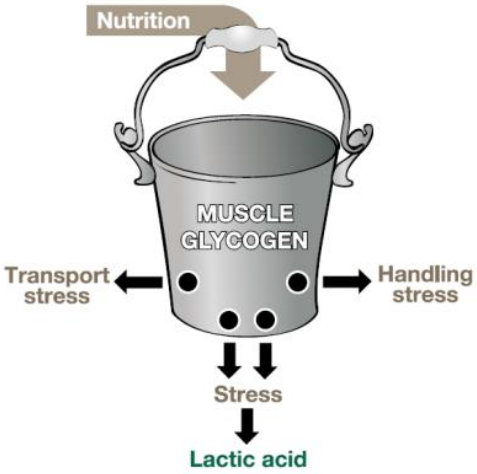
- Poor handling and transport
- Prolonged muscular activity
- Extreme temperatures
- Mixing of unfamiliar cattle
- Drafting of mobs
- Poor nutritional status

Glycogen is the energy store of muscle and can be visualised as a 'bucket' of energy. This energy reserve is used during stressful events, physical activity or after the death of the animal. Once the animal is dead, the muscle glycogen is used as the primary energy source and is converted to lactic acid. This lactic acid is unable to be removed from the body as the animal's blood flow and oxygen supply has ceased. Therefore the acid gradually accumulates, reducing the pH of the muscle.

When muscle glycogen is depleted prior to slaughter, the lactic acid production after death is limited resulting in higher ultimate pH levels and dark cutting meat. Therefore pre-slaughter stressors need to be avoided as much as possible.

Other than the poor eye appeal of the dark meat colour, dark cutting meat has a range of associated quality issues:

- The pH of the meat is generally higher than the acceptable MSA requirement of pH 5.70
- Shelf life of dark cutting meat is decreased due to the high pH conditions being ideal for microbial growth
- Eating quality inconsistencies
- Cooking inconsistencies

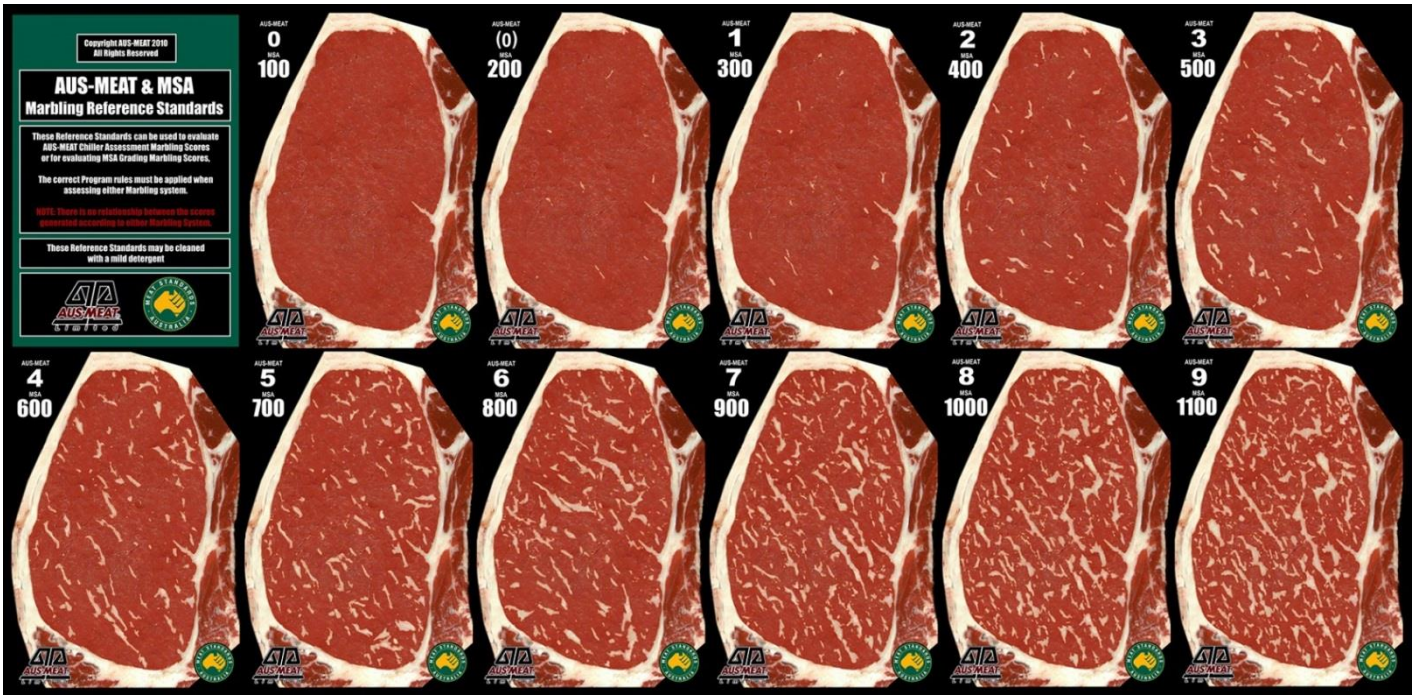


Dark cutting meat has very limited retail use. Therefore, dark cutting carcases can be heavily discounted.

2.2.3 Marbling

Marbling is the fat that is deposited between individual muscle fibres and is assessed at the M. longissimus dorsi (eye muscle) at the ribbing site of the carcase. Assessment of marbling should encompass three factors:

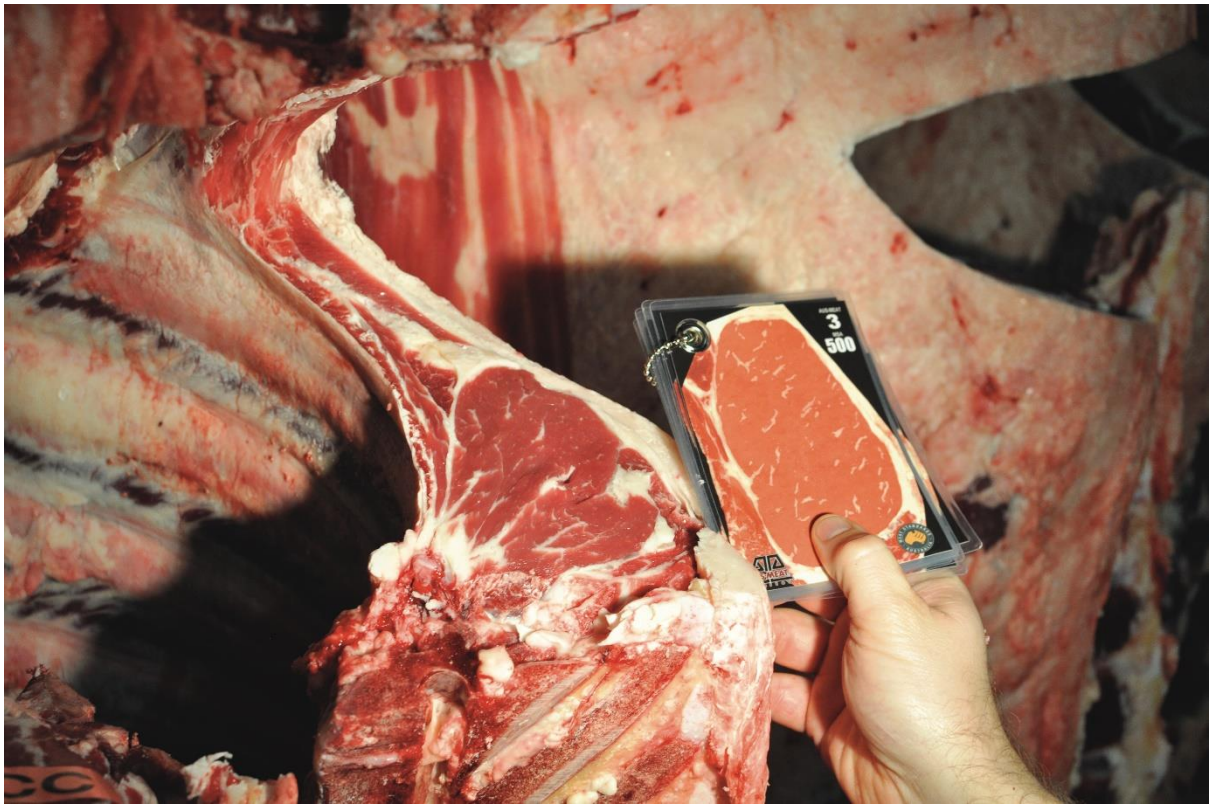
A. Distribution of marbling within the eye muscle – ideally marbling is evenly distributed throughout the eye muscle resulting in the consumer having a consistent eating experience with every bite of their steak.
B. Size of marbling pieces
C. Amount of marbling.



The extent of marbling expression in a carcase is genetically pre-determined. Nutrition plays an important role in fostering the expression of marbling. It is the last body fat to be deposited and the first to be utilised by the animal as an energy source. Therefore, to maximise marbling, cattle must be on a high nutritional plane, with minimal pre-slaughter stress or growth restrictions.

The effect of marbling on eating quality

Marbling has a very positive effect on eating quality but is only one of the many factors affecting eating quality. The relationship between marbling and tenderness is variable and may interact with cooking technique. The advantage in palatability with an increase in marbling may not necessarily be attributed to an increase in tenderness but more so an effect on juiciness and flavour. Marbling is often used as a benchmark measurement for particular market specifications.



2.2.4 Carcase defects

Blood splash (Ecchymosis)

"Blood splash" or ecchymosis is a condition characterised by localised areas of haemorrhaging within the muscles of a beef carcase. 'Blood splash' results when the animal's blood pressure is elevated to an abnormally high level before exsanguination, causing the capillaries in the musculature to rupture. An abnormally long stun-to-stick interval at the time of slaughter is thought to be the primary cause of this condition.

Blood splash does not have any effect on eating quality but can result in a reduced eye appeal for consumers.

Ecchymosis present in the longissimus dorsi muscle

2.2.5 Ossification (Maturity)

Reference: MSA Tips & Tools MSA06 – Ossification and beef eating quality

Reference: AUS-MEAT "Handbook of Australian Beef Processing" The AUS-MEAT Language

The scoring of ossification (or maturity) provides a scale for the assessment of physiological age of a bovine animal. The term refers to the cartilage turning to bone in the spinous processes in three sections along the backbone - sacral (tail), lumbar (loin) and thoracic (head). The process starts in the sacral region in the form of red spots and as the process increases, this converts to hard yellow bones.

Processors have also realised the benefits of high growth, particularly from a dressing percentage and saleable meat yield perspective. Cattle that have had a faster growth rate and which have not suffered any setbacks do not normally deposit very much seam and/or channel fat. As a result their yields are higher. Cattle that have a consistent growth rate from birth to slaughter at 20-24 months are also likely to have a more even fat distribution.

Effect of ossification on eating quality

Beef is made up of muscle fibre groups surrounded and supported by connective tissue. Connective tissue is made up of elastin and collagen fibres. Collagen fibres form crosslinks to strengthen muscle as the animal ages. Therefore, as the animal matures, the fibres in the meat become progressively stronger and are less likely to break down during cooking resulting in a tougher eating experience. Ossification measurements provide an indication of this collagen fibre development.

Ossification rates will vary slightly between animals. This can be due to differences in nutrition growth paths. Those animals that have experienced growth setbacks and poor nutrition will exhibit greater levels of ossification than animals of the same chronological age grown in optimal conditions.

Regions of ossification

1. **Sacral region**

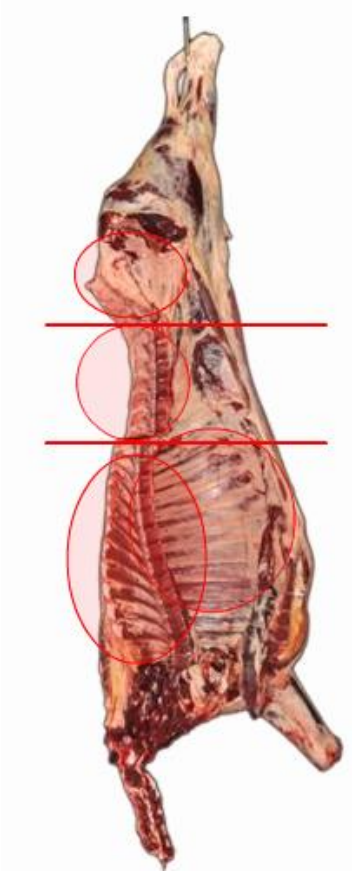
The last 5 vertebrae, tail end of the carcase

2. **Lumbar region**

6 vertebrae in the loin region

3. Thoracic region

13 vertebrae to which the ribs are attached



The scale of ossification runs from 100–590 and follows the scale developed by the United States Department of Agriculture grading service (Table below). The following table details these scores with regards to the development of cartilage to bone in the respective regions.

Ossification Standard Table

SCORE	APPROXIMATE AGE IN MONTHS	SACRAL VERTEBRAE	LUMBAR VERTEBRAL SPINOUS CHARACTERISTICS	11TH, 12TH, 13TH THORACIC SPINOUS PROCESS CHARACTERISTIC	1ST – 10TH THORACIC SPINOUS PROCESS CHARACTERISTICS	RIB BONE CHARACTERISTICS
100	9	No distinct ossification separation.	No ossification.	No ossification.	No ossification.	Narrow and oval. Lot of blood.
110	10	Capping has started. 10% to 20%.	No ossification.	No ossification.	No ossification.	Slightly narrow Slightly oval. Lot of blood.
120	13	Capping to 30% to 40%. Vertical gaps starting to close.	No ossification.	No ossification.	No ossification.	Slightly wide and flat. Lot of blood
130	15	Advanced capping to 50% to 70%. Vertical gaps closing. Some separation still visible.	No ossification.	No ossification.	No ossification.	Slightly wide. Slightly flat. Moderate blood.
140	18	Advanced capping 80% to 90% Vertical Gaps closing, Some separation still visible,	No or minor spots of ossification in one or two vertebrae.	No ossification.	No ossification.	Slightly wide. Slightly flat. Moderate b.lood
150	20	Capping completed but some cartilage visible.	No or small amounts of ossification in some vertebrae.	No ossification.	No ossification.	Slightly wide. Slightly flat. Moderate blood.
160	22	Capping completed but small amounts of cartilage visible	10% to 20% ossification in some vertebrae.	No ossification.	No ossification.	Slightly wide. Slightly flat. Moderate blood.
170	24	Capping completed. Almost complete fusing.	30% to 40% ossification.	No ossification.	No ossification.	Slightly wide. Slightly flat. Small amount of blood.
180	27	Capping completed. Almost complete fusing.	50% to 70% ossification in all vertebrae.	No or minor spots of ossification in one or two vertebrae.	No ossification.	Slightly wide. Slightly flat. Small amount of blood.
190	29	Capping completed. Almost complete fusing.	80% to 90% ossification in all vertebrae.	Less than 25% ossification in all 3 Spinal process., or 100% in any 1 Spinal process.	No ossification	Slightly wide. Slightly flat. Small amount of blood.
200	30	Complete fusing.	Almost complete ossification.	>25% ossification in all 3 Spinal process., or 100% in any 1 Spinal process.	Minor ossification Slightly red chine.	Slightly wide.. Moderately flat. Traces of blood..
230		Complete fusing.	Almost complete ossification.	30% to 40% ossification in all 3 Spinal process , or 100% in any 1 Spinal process.	Minor ossification in some of the first 6 thoracic vertebrae. 10% to 20% in 7th to 10th vertebrae.	Slightly wide Moderately flat Traces of blood

SCORE	APPROXIMATE AGE IN MONTHS	SACRAL VERTEBRAE	LUMBAR VERTEBRAL SPINOUS CHARACTERISTICS	11TH, 12TH, 13TH THORACIC SPINOUS PROCESS CHARACTERISTIC	1ST – 10TH THORACIC SPINOUS PROCESS CHARACTERISTICS	RIB BONE CHARACTERISTICS
250		Complete fusing.	Almost complete to complete ossification.	>50% ossification in all 3 Spinal process, or 100% in any 1 Spinal process.	10% to 20% ossification in some of the first 6 thoracic vertebrae. 30% to 50% in 7th to 10th vertebrae.	Moderately wide Moderately flat Traces of blood
280		Complete fusing.	Complete Ossification.	>70% Ossification in all 3 Spinal process, or 100% in any 1 Spinal process.	>30% in the 1st to 10th vertebrae.	Moderately wide Moderately flat Traces of blood.
300	42	Complete fusing.	Complete ossification.	80% to 90% ossification in all 3 Spinal process , or 100% in any 1 Spinal process.	More than 30% ossification in first 6th thoracic vertebrae. 50% to 70% in 7th to 10th vertebrae.	Moderately wide Moderately flat Traces of blood
350		Complete fusing.	Complete ossification.	Almost complete to complete ossification.	40% to 80% ossification involving all vertebrae.	Wide and flat No blood.
400	72	Complete fusing.	Complete ossification.	Complete ossification . Outlines barely visible.	Almost complete ossification. Outline plainly visible.	Wide and flat No blood.
500	96	Complete fusing.	Complete ossification.	Complete ossification.	Complete ossification. Outline barely visible. White chine.	Wide and flat No blood.
590		Complete fusing.	Complete ossification.	Complete ossification.	Complete ossification. White chine.	Wide and flat No blood..

Soft siding

When a carcase is sawn exactly in the middle of the spine, the spinal processes are clearly visible. This enables accurate evaluation of ossification.

Soft siding occurs when the carcase is not sawn exactly in the middle of the spine and is a result of slaughter floor processes. Due to the spine not being clearly visible, is must be assumed that there is complete ossification under the area affected by soft siding. The ossification score for that body may be called unnecessarily higher than it actually is.

Tips for evaluating ossification

- When possible always evaluate both sides of a carcase when deciding on a score.
- Start assessment from the head and work towards the tail.
- If there is soft siding, assume ossification is fully developed in the region in question.

2.3 Beef carcase yield

Carcase or retail product yield refers to the amount of retail or saleable product which can be achieved from a given carcase weight.

A carcase is composed of muscle, bone and fat. Carcases with high yield percentages have maximum muscle, minimum bone and optimal fat for a particular market.

The highest yielding carcases are both heavily muscled and lean while the lowest yielding carcases tend to be lightly muscled and over fat or poorly finished and both lean and lightly muscled.

Carcase yield is influenced by the following factors which require consideration when evaluating a carcase;

- Fat coverage
- Carcase weight
- Muscularity
- Bruising and carcase defects
- Sex

2.3.1 Fat coverage

Reference: MSA Tips & Tools MSA14 – Fat distribution and eating quality

The primary determinant of retail product yield (%) is the amount of fatness or degree of finish on a carcase.

The only accurate way of determining the amount of fatness on a carcase is to completely denude the carcase of all subcutaneous and intermuscular fat. Theoretically this is an exercise which can be done in either a laboratory or boning room, but it is very time consuming, costly and impractical.

As a result, the industry uses indicators to predict degree of carcase fatness. Three fat measurements can be used to provide an indication of fat coverage:

1. Rib fat measurement – made at the rib site where the carcase is quartered
2. P8 fat measurement – made at the P8 site on the rump
3. Fat distribution across the carcase

Measuring P8 fat

Reference: ***AUS-MEAT "Handbook of Australian Beef Processing" The AUS-MEAT Language***

Beef fat depth is measured at a point in the carcase known as the P8 site. To locate the P8 site:

- Locate the third sacral spinal process by counting up from the junction of the lumber and sacral vertebrae.
- Take an imaginary line from the crest of this process around the side and at right angles to the sawn chine.
- Next, an imaginary line is drawn from the centre of the junction of the sacro-sciatic ligament and the dorsal tuberosity of the pin bone parallel to the sawn chine.
- The point at which these two lines intersect is the P8 site.

(The P8 site is a point defined by the following anatomical description: *The point of intersection of a line from the dorsal tuberosity of the tripartite tuber ischii parallel with the chine, and a line at 90o to the sawn chine centred on the crest of the spinous process of the third sacral vertebrae).*

Measuring rib fat

Rib fat is measured in the chiller on the chilled, quartered carcases. MSA requires all carcases to have a minimum of 3mm rib fat.

Carcases differ in the way they distribute fat and this can be a result of cattle breed or nutritional background.

Heavily muscled or late maturing cattle breed (e.g. Limousin, Charolais) tend to distribute fat a little more evenly over the forequarter and tend to be leaner over the hindquarter. Carcases with extreme muscularity, including cattle breeds such as the Belgian Blue usually lack finish over the butt altogether. Lightly muscled carcases tend to distribute fat very unevenly with large fat deposits through the flank up over the ribs and into the brisket. Large deposits necessitate costly and time consuming trimming and in doing so reducing the value of the carcase.

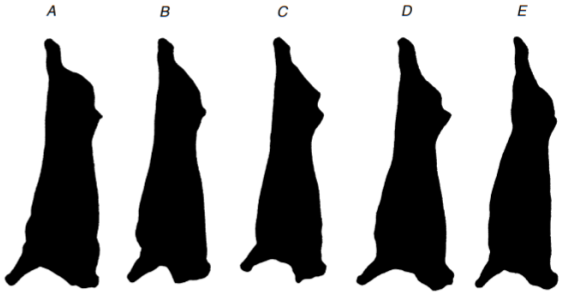
In general, carcase yield is very sensitive to fat. Exceptionally high yield can be obtained from carcases with no fat e.g.: bulls used for manufacturing beef. However most premium markets require some fat to market the product and ensure satisfactory eating quality.

Although excess fat can result in a decreased yield outcome, sufficient fat coverage is required to ensure carcases are protected against abattoir chilling regimes that can cause muscles to cool too quickly and result in toughened meat. Adequate fat coverage can also be beneficial in reducing weight loss during chilling.

Adequate and inadequate fat distribution (left to right respectively).

2.3.2 Muscularity

Muscularity is often used as a predictor of carcase yield. Often carcases with a muscle score of D or less get heavily discounted as they can have very poor yields regardless of their potential eating quality.



When evaluating carcass muscularity, eye muscle area can be measured to predict carcase yield.

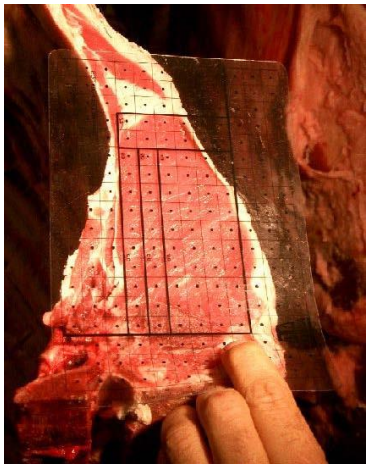
Eye Muscle Area (EMA):

Eye Muscle Area is a measure of the size of the longissimus dorsi muscle also known as the rib eye in square centimetres. This measurement is made at the carcase quartering sites which can be between the 10-13th rib.

Assessment is manually conducted using an AUS-MEAT EMA grid to calculate the area of the eye muscle.

The rib eye area is used because it is practical and has commercial significance. However, it must be remembered that the longissimus dorsi is just one muscle in the body and its relative size at the quartering site is only an indicator of total muscularity.

Eye muscle area does not have any effect on eating quality for the MSA program and is used solely as a feedback tool for vendors/producers.



2.3.3 Bruising and hidepuller damage

Reference: MSA Tips and Tools 14 – Fat distribution and eating quality

Reference: AUS-MEAT "Handbook of Australian Beef Processing" The AUS-MEAT Language

Bruising and hide puller damage can make carcases unsaleable or less profitable. Bruising in an animal as a result from poor transport or mishandling pre-slaughter can result in large sections of the carcase having to be trimmed by meat inspectors. Hide puller damage occurs when fat is removed during the mechanical removal of the hide, exposing the underlying muscle.

Bruising and hide puller damage has the greatest impact on yield when high value primals are affected. Carcase yield is not only reduced due to muscle damage and limited saleability but is also reduced through the lack of fat coverage that provides protection against chilling regimes which also dehydrate the exposed muscles.

Not only can carcase saleability be reduced, eating quality can be compromised through uneven chilling of carcase muscles. This can cause an irregular pattern of pH and temperature decline in those muscles and result in increased muscle toughening.

Scorable Bruise Description:

1. Where muscle is bruised, it qualifies as a scorable bruise if; an area of muscle (exposed) by trimming into the muscle tissue to the extent that it cannot be covered by a 100mm diameter circle or an irregular shaped equivalent area.
2. Where the trimming of a serious bruise has exposed muscle tissue smaller than 100mm and deeper than 20mm.

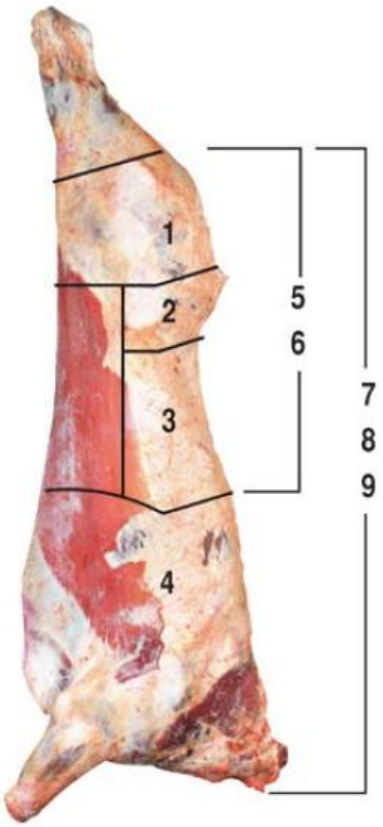
Serious (flank bruise):

A serious bruise located in the thin flank area is recorded as a score (3) when the muscle tissue of the primal (striploin) is damaged.

Where a bruise straddles two scorable areas:

1. The score will be recorded in the area where the bruise is most predominant.
2. A straddle bruise that covers at least 100 mm in both scorable areas will count as separate bruises and be recorded as such.

The AUS-MEAT Bruise Scoring System



SCORE	LOCATION	NUMBER OF SERIOUS BRUISE AREAS
1	BUTT	1
2	RUMP	1
3	LOIN	1
4	FOREQUARTER	1
5	HINDQUARTER	2
6	HINDQUARTER	3
7	FOREQUARTER HINDQUARTER	2
8	FOREQUARTER HINDQUARTER	3
9	SIDE	4

Examples of yield loss due to bruising and hide puller damage.

2.3.4 Sex Class/Gender

Reference: ***AUS-MEAT "Handbook of Australian Beef Processing" The AUS-MEAT Language***

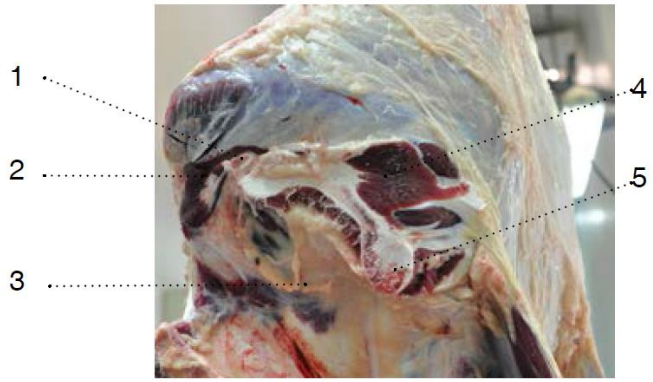
Sex can play a role in determining yield of a carcase due to differences in mature weight, mature composition and maturing patterns for individual tissues.

Male carcases are recognised by the typically rough and irregular fat in the region of the cod, the relatively small pelvic cavity, a small "pizzle eye", a curved aitch bone, and a lean area above the aitch bone that is about half as large as that in a female carcase.

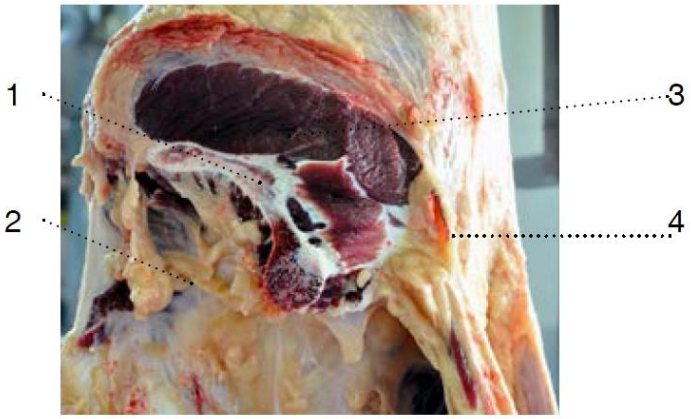
Female carcases are identified by very smooth fat in the region of the udder, a slightly larger pelvic cavity, a straighter aitch bone than is typical of steers and a lean area above the aitch bone that is about twice as large as that in a steer carcase. This lean area is shaped like a kidney bean.

Identifying a male carcase

1. Penis stub
2. Erector muscle
3. Pelvic channel
4. Smaller triangular muscle
5. Aitch bone



Identifying a female carcase



1. Aitch bone
2. Pelvic channel
3. Larger lean area
4. Udder fat

2.4 Beef eating quality

The eating quality of beef is ultimately determined by the consumer based on their eating experience. When a consumer makes a judgement on eating quality of beef, they consider the following attributes to be of importance:

- Tenderness
- Flavour
- Juiciness
- Overall liking

A combination of carcases attributes are measured to provide indicators that are used to predict eating quality. In addition to livestock factors, the following attributes can be used to predict eating quality of beef:

- Marbling
- Ossification
- pH

2.4.1 pH and eating quality

Reference: MSA Tips and Tools MSA08 - The effect of pH on beef eating quality

pH is a measure of the acid or alkaline level of the meat. As previously mentioned meat colour is directly associated with pH. Beef which measures a pH value below 5.70 is more likely to provide a consistent eating experience.

Accordingly, 5.70 has been set as the maximum acceptable pH level for MSA grading. In addition to unacceptable eating quality high pH meat has the following features:

- It is often found to be dark cutting (refer to carcase quality section for more information)
- A coarse texture
- Reduced shelf life – bacteria grow more rapidly due to high pH conditions
- Lower water-holding capacity – which result in moisture loss during cooking and a less juicy product.

2.5 Evaluating beef carcases

Key points when evaluating carcases

- Understand quality and yield attributes and commercial implications of each
- Dark cutting carcases can be heavily discounted
- A key quality attribute used in carcase evaluation is marbling
- Highest yielding carcases will be those with heavy muscling and light fat coverage
- Eye muscle area is an important factor used in determining muscling and yield
- Significant bruises on key primals will affect yield
- The sex of a carcase should not impact on your evaluation (judging) of carcase but should definitely be observed
- Always consider ossification in your observations. Ossification should be used in conjunction with marbling when considering overall carcase quality. Small differences in ossification won't largely vary eating quality, but large variances will.

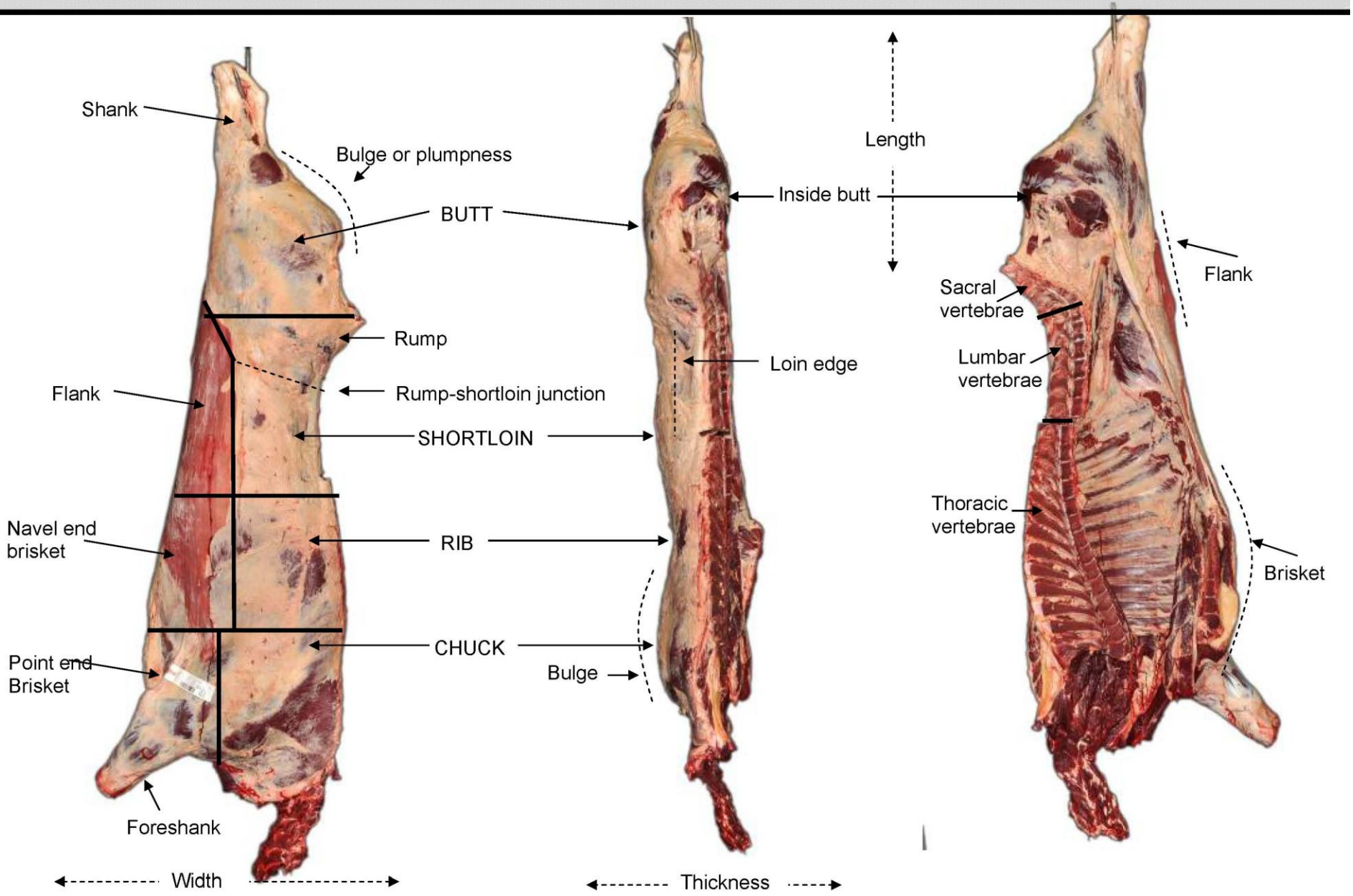
ICMJ Beef Carcase Judging YouTube https://www.youtube.com/watch?v=TAeDF-23YOg

The following table provides terminology for each major assessment point that can be used to describe and justify appraisal of a carcase.

Evaluation terminology for beef carcases

Muscling	Trimness	Quality
Rib eye Larger More symmetrically shaped **Butt** Thicker Plumper More bulging Wider Longer More muscular **Sirloin** Thicker Fuller More muscular More bulging More prominent **Loin** Thicker Fuller Wider More muscular **Rib** Plumper Fuller More muscular **Chuck** Thicker Wider Deeper More muscular More bulging **Shank** Shorter	**Less fat opposite the:** • Ribeye **Less fat over the:** • Lower rib • Butt • Sirloin • Rump-shortloin junction • Loin • Loin edges • Rib • Chuck • Brisket • Flanks	**Marbling in the rib eye** Higher degree Greater amount More finely dispersed More evenly dispersed **Colour of lean in rib eye** Brighter More youthful More cherry red **Firmer lean in rib eye** **Finer textured lean in rib eye** **Ossification** **Fat** More desirable Whiter Firmer textured **Ribs** More youthful Redder, rounder Feathering between **Sex**

Beef carcase terminology



Examples of questions asked during ICMJ contest - Beef carcase judging

Questions asked may be based on:

1. Observations over the whole class (e.g. how many males in the class?)
2. Observations made on the extremes (e.g. which carcase had the largest eye muscle area?)
3. Comparisons between carcases (e.g. Between Carcase 2 and 3, which displayed the greatest amount of ossification?)

Tip: It is likely that a proportion of questions will be based on very noticeable carcase attributes rather than slight differences between carcases. For example, if one carcase has significantly more yellow fat than the others, this is likely to be a question to test your observation skills, rather than asking you which was fatter over the rib eye if there was only 2mm difference between all carcases.

Other examples may include, *which carcase (or between carcases) has:*

- The smallest/largest eye muscle area?
- Least trimmable fat alongside the rib eye?
- The thinnest poorest/heaviest muscled butt?
- Heaviest muscled chuck
- The highest amount of marbling?
- The thickest, widest, deepest, heaviest muscled butt?
- The brightest, most youthful lean (meat) in the rib eye
- Highest yielding (i.e. highest cutability)
- Finest/coarsest meat texture
- Highest/lowest quality
- The most trimmable fat/least fat over the brisket; sirloin; loin; ribset; chuck; rib-eye; butt cushion; centre section (the question could ask about these individually or a combination)
- Younger/older ossifications score
- How many females/males?
- Which is the highest yielding carcase?

2017

1. Which carcase displayed the least marbling in the class?
2. Which carcase is the fattest lowest yielding?
3. Which carcase combined quality and yield to the highest degree?
4. Which carcase had the most fat along the side of the rib eye?
5. Between 1 and 2, which displayed the darkest coloured lean in the rib eye?
6. Which carcase had the lightest muscled butt?
7. Between 2 and 4, which carcase displayed the least amount of fat over the brisket?
8. Which carcase had the largest eye muscle area?
9. How many females were in the class?
10. Which carcase displayed the most ossification?

2.6 Beef pricing class

The beef pricing class assesses your observation skills in identifying carcase attributes that can affect yield and/or quality of a carcase.

This class is based on current industry practices and uses a pricing grid reflective of a standard processor pricing grid that carcases must be graded against and how producers are paid.

The main features of a pricing grid may include:

- Carcase weight
- Fat depth (P8)
- Gender
- Dentition
- Maturity
- Fat colour
- Meat colour
- MSA compliance (rib fat and pH)
- Bruising
- Marbling
- HGP Status
- EU eligibility
- Blood splash

Carcase tickets:

During the beef pricing class in the ICMJ contest, some information will be provided to you by ICMJ in the form of a "mock" carcase ticket. This information will include:

- Carcase weight
- Fat depth (P8)
- Dentition

Note - during this class, ignore any carcase tickets that have been generated by the processor (as seen below) and may still be attached to the carcase.

Example of a carcase ticket

Maturity

For the ICMJ beef pricing class you must understand the scoring system for ossification. See above section on ossification.

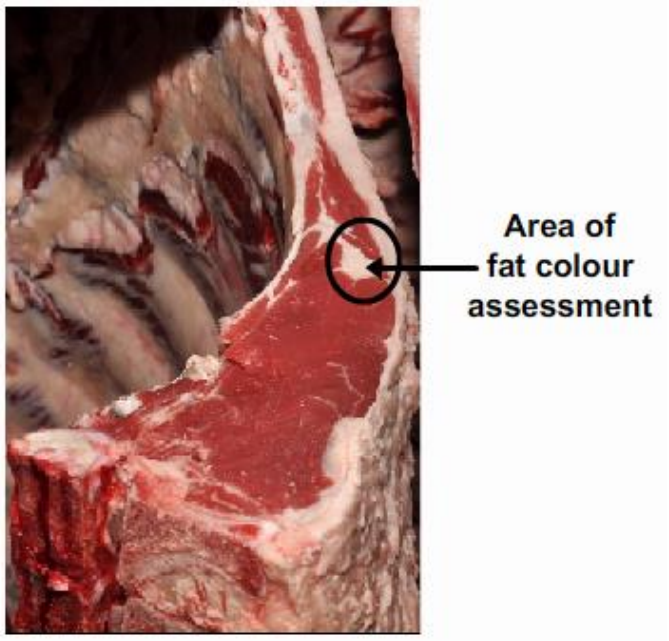
Meat colour

The pricing grid applies a price penalty when meat colour is assessed as being greater than an AUSMEAT Meat Colour 3. A meat colour above 3 will show signs of being dark and may also look to have a 'sticky' texture. Meat colour may or may not be part of a company grid due to differences in target specification.

Fat colour

Certain pricing grids apply a price penalty to carcasees assessed and found to have a AUS-MEAT Fat Colour above 3. This does not affect eating quality but is primarily due to consumer acceptance of fat colour.

Here is a picture illustrating where fat colour is assessed. Note this is not an external fat colour measurement.



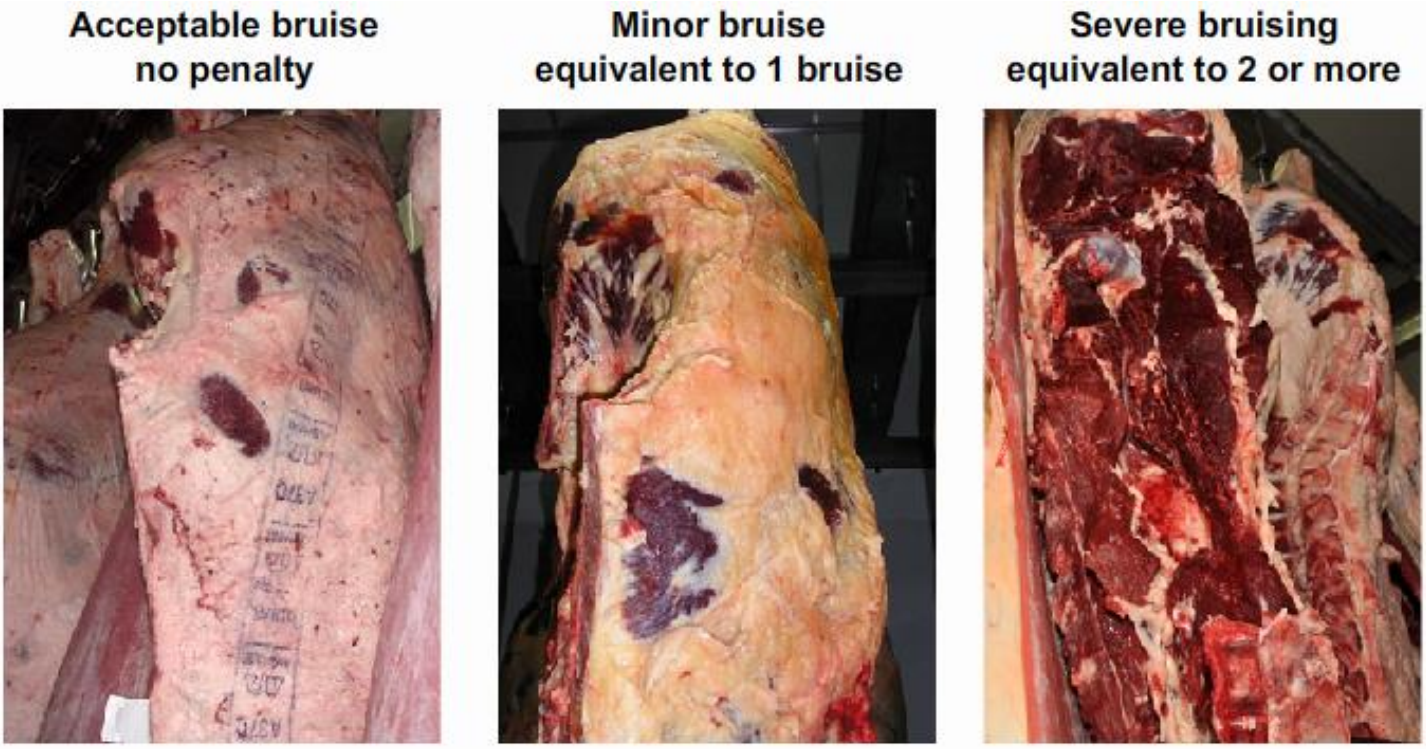
Bruising

A carcase will be penalised for bruising if the bruise is affecting valuable areas of meat.

A serious bruise is determined as an area that is greater than 10cm2 on any one single primal

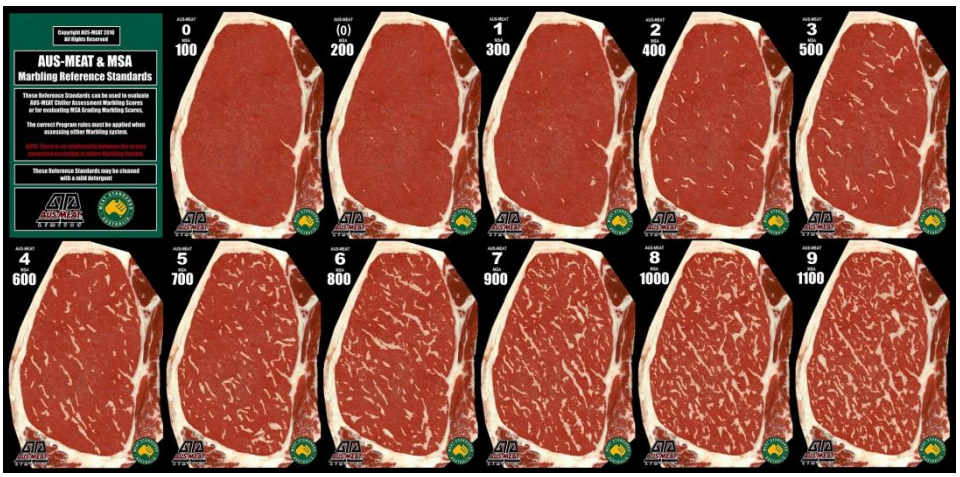
Multiple bruises or individual bruises that greatly exceed this size will incur larger price penalties.

Below are examples of varying degrees of bruising.



Marbling

Marbling increases eating quality of a carcase and so a price adjustment is made in the pricing grid for various marbling scores. Below are examples of the MSA marbling scores which you should be familiar with.

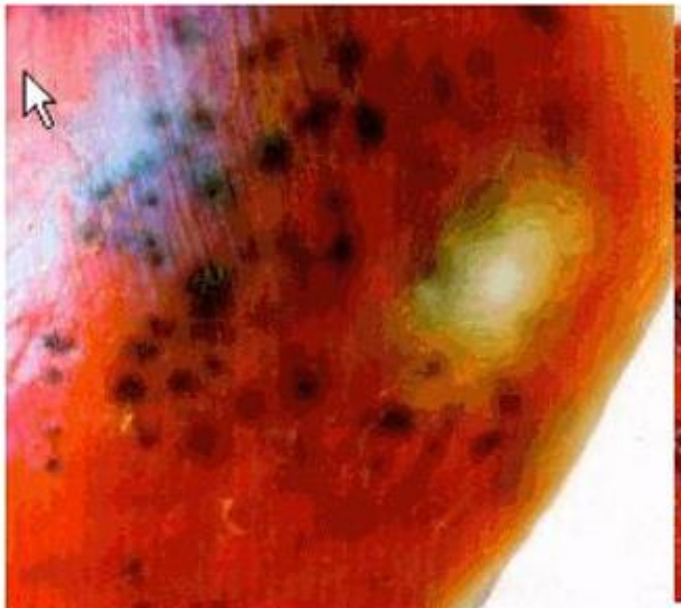


Blood splash

Blood splash must be considered quite severe before a price adjustment is made.

Severe ecchymosis would be very obvious in the eye muscle and appears as numerous burst blood vessels throughout the muscle.

Below are pictures of severe ecchymosis that would incur a price penalty.



2.7 Beef Eating Quality Class

This class will apply the industry practice of carcase eating quality evaluation, based upon the Meat Standards Australia grading system.

Students are required to determine an eating quality score for each carcase through assessing required carcase attributes and applying positive and/or negative adjustments to an eating quality score using a provided grid.

Carcase measurements

The eating quality evaluation class requires you to assess a number of carcase attributes including:

- Sex
- Ossification
- MSA Marbling
- Rib fat (no rulers will be provided)
- Fat distribution
- Meat colour

The following carcase attributes are provided by ICMJ:

- Tropical Breed Content
- Hormonal Growth Promotant (HPG) treatment
- Carcase weight
- pH

Tips for evaluating carcases for eating quality:

- Have a good understanding of the Meat Standards Australia grading system.
- Read MSA materials, in particular MSA Tips & Tools, on MLA website: www.mla.com.au/msa.
- Ensure you are familiar with MSA marbling standards.
- Have a thorough understanding of the ossification chart (Table above) and have a good knowledge of your 'key' ossification score cut-offs as per the grid.
- Ensure you know where rib fat is measured and have a good idea of what different measurements look like. You can practice this by drawing lines on a page, estimating their length and then measuring them.
- Make sure you have a good idea of what the fat distribution standard is. I.e. carcases with inadequate fat distribution of an area of 10 x 10cm covering a single primal are classified as ungrades. Again, practice drawing different shapes on a page and guessing the area, then measuring it.
- Make sure you understand the working sheet and answer sheet.
- If you do not have access to beef carcases, practice by making up carcase details on paper and using the work sheets to increase your speed in recording details and doing calculations.
- We advise downloading the practice carcase detail sheets. These sheets have all carcase assessments filled in and will provide practice using the eating quality grid and applying adjustments.

2.8 Beef primal evaluation

When carcases are boned, they are broken down into primals. The same broad attributes that are used in carcase evaluation are also used when appraising beef primals. These are grouped as:

- Eating Quality
- Yield – most suitable combination of trimness and muscling

Importantly, there are differences between the evaluation of primals within a carcase. This difference is dependent on the relative market value of each primal and therefore the importance of quality and yield for each primal.

There is not any one trait that makes an ideal product. When evaluating beef primals, the above attributes should be considered independently in combination with the market suitability of the individual primal.

Key points for evaluating/judging beef primals

You MUST know your primal face names – they will be used during questions and important when writing reasons.

2.8.1 Evaluating butts

Emphasis: Yield (muscling plus trimness) followed by quality

Areas of evaluation:

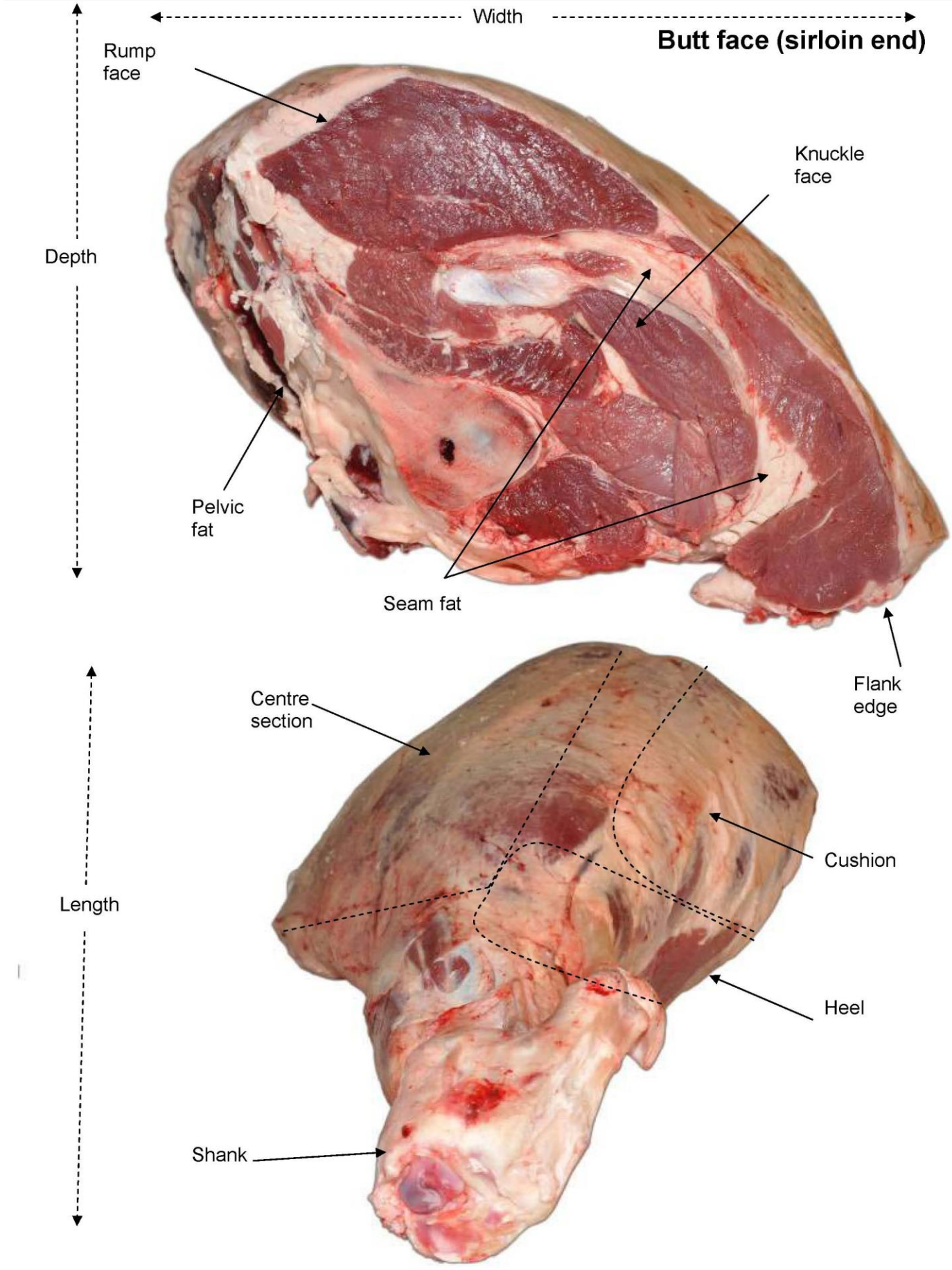
- Exposed lean on the butt face – trimness and quality
- Cushion area (diagonally as well) – trimness and yield
- The heel – trimness and yield

ICMJ Beef Butts Judging YouTube https://www.youtube.com/watch?v=NUxrxZbefWU

Evaluation terminology for beef butts

Muscling	Trimness	Quality
Butt face Larger Greater area of exposed lean **Rump and knuckle face** Greater area of exposed lean Deeper Wider Meatier Larger **Cushion** Plumper More bulging More muscuar Deeper Thicker **Centre section** Wider Deeper Longer More muscular **Heel** Fuller **Shank** Shorter	**Less fat over the:** • Butt face • Rump face • Knuckle face • Cushion • Centre section • Rump section • Heel • Less internal seam fat in the round face • Less pelvic fat	• Focus on brighter, more cherry-red colour of firmer lean in the round face • Marbling and texture if differences are obvious • External fat – whiteness and firmness

Beef butts terminology



2016

1. Which butt displays the greatest area of exposed lean?
2. Between 2 and 3, which butt is trimmer over the heel?
3. Which is the lightest muscled butt in the class?
4. Between 1 and 4, which butt has the larger the knuckle face?
5. Between 2 and 3, which butt has the larger rump face?
6. Between 1 and 4, which butt is wider through the centre section?
7. Which butt has the most trimmable fat over the CC?
8. Between 2 and 3, which butt is deeper through the CC?
9. Which butt displays the greatest degree of marbling?
10. Which butt has the highest retail value?

2015

1. Which primal has the smallest rump face in the class?
2. Which primal has the least amount of exposed lean in the butt face?
3. Which primal has the least amount of exposed lean in the butt face?
4. Which butt has the most marbling in the rump face?
5. Between 1 and 3, which is deepest through the centre section?
6. Which butt is widest in the butt face?
7. Which butt has the least seam fat in the class?
8. Between 1 and 3, which has the trimmer, more muscular heel?
9. Which primal is the most muscular, highest yielding butt in the class?
10. Which butt is the trimmest over the centre section?

2014

1. Which primal was the deepest through the centre section?
2. Between primals 1 and 2, which displayed the least amount of lean in the knuckle face?
3. Which primal had the least amount of exposed lean in the rump face?
4. Which primal had the least amount of exposed lean in the rump face?
5. Which primal displayed the most seam fat in the class?
6. Between primals 2 and 3, which was deeper through the centre section?
7. Which primal was fattest over the cushion?
8. Which primal displayed the most marbling in the rump face?
9. Between primals 3 and 4, which displayed the least amount of pelvic fat?
10. Which primal was the lowest yielding in the class?

2.8.2 Beef rump and loins

Emphasis: Quality followed by yield and trimness

The rump and loin primals are high value cuts for the Australian and export markets.

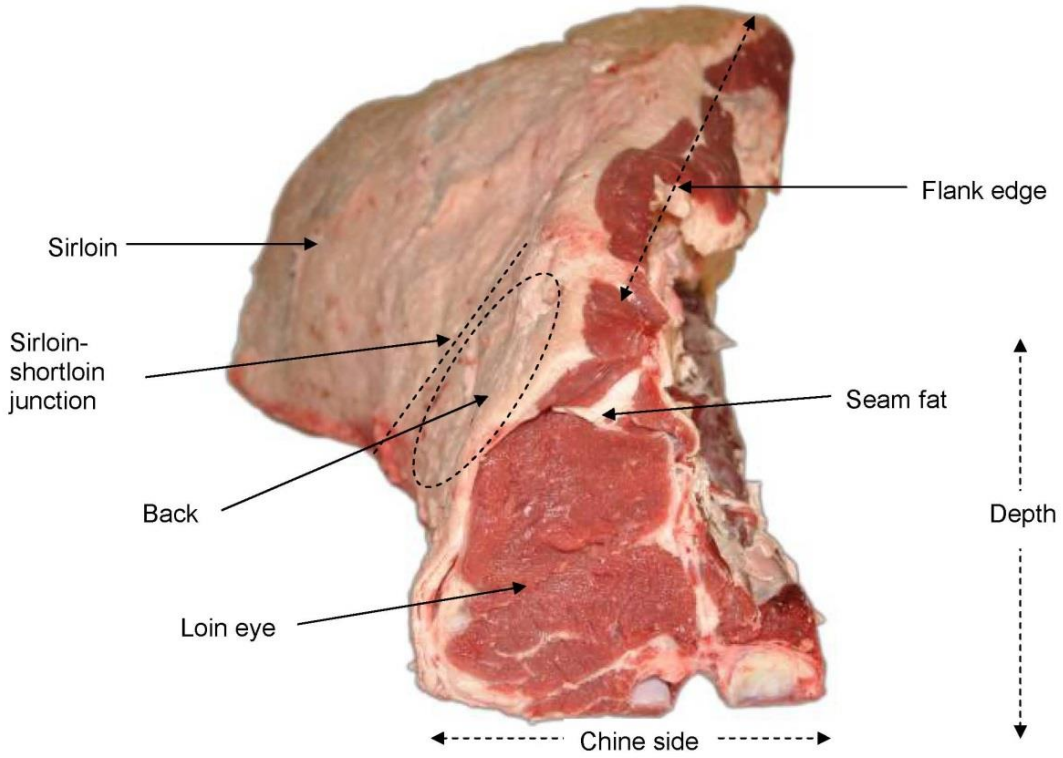
Areas of evaluation for rump and loins:

- Loin eye – muscularity, trimness, quality
- Rump face – quality, muscularity, trimness
- Loin edge – external trimness
- Flank – external trimness

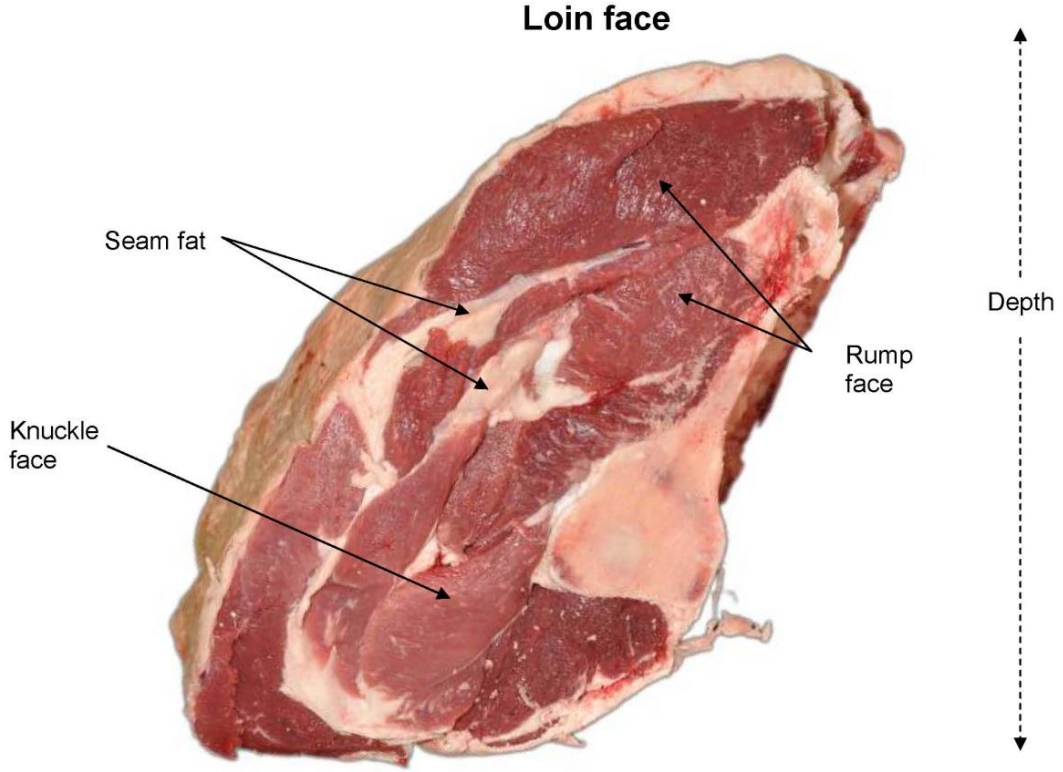
Evaluation terminology for rump and loins

Muscling	Trimness	Quality
Loin eye Larger More symmetrically shaped **Sirloin face** Greater area of exposed lean Deeper Wider Meatier Larger **Shortloin** Plumper Wider More muscular Fuller Longer **Sirloin section** Plumper Fuller Wider More muscular	**Less fat over the:** • Loin eye • Tail region • Sirloin face (top and bottom) • Shortloin section/back • Sirloin section • Sirloin-loin junction • Loin edge • Flank edge Less seam fat in the sirloin face Less kidney and pelvic fat	**Marbling in the loin eye and sirloin face** • Higher degree • Greater amount • More finely dispersed **Colour of lean in loin eye and sirloin face** • Brighter • More youthful • More cherry red **Firmer lean in loin eye and sirloin face** **Finer textured lean in loin eye and sirloin face** **Fat** Whiteness Firmness

Beef rump and loin terminology



Loin face



Sirloin face

Examples of questions used for rump and loin evaluation classes in ICMJ contest

2013

1. Which primal has the most seam fat in the sirloin face?
2. Which primal has the most seam fat in the sirloin face?
3. Which primal has the least amount of exposed lean in the sirloin face?
4. Which primal has the least amount of exposed lean in the sirloin face?
5. Which primal is trimmest over the rump face?
6. Between 1 and 3, which primal would yield the lowest percentage of closely trimmed retail cuts?
7. Between 1 and 3, which primal would yield the lowest percentage of closely trimmed retail cuts?
8. Between 2 and 4, which primal has the larger loin eye in the loin face?
9. Which primal is trimmest over the sirloin-loin junction?
10. Between 1 and 3, which primal has the most exposed lean in the rump face?

2.8.3 Beef Shortloins

Emphasis: Quality followed by yield and trimness

Shortloins are a high value cut for Australian and export markets.

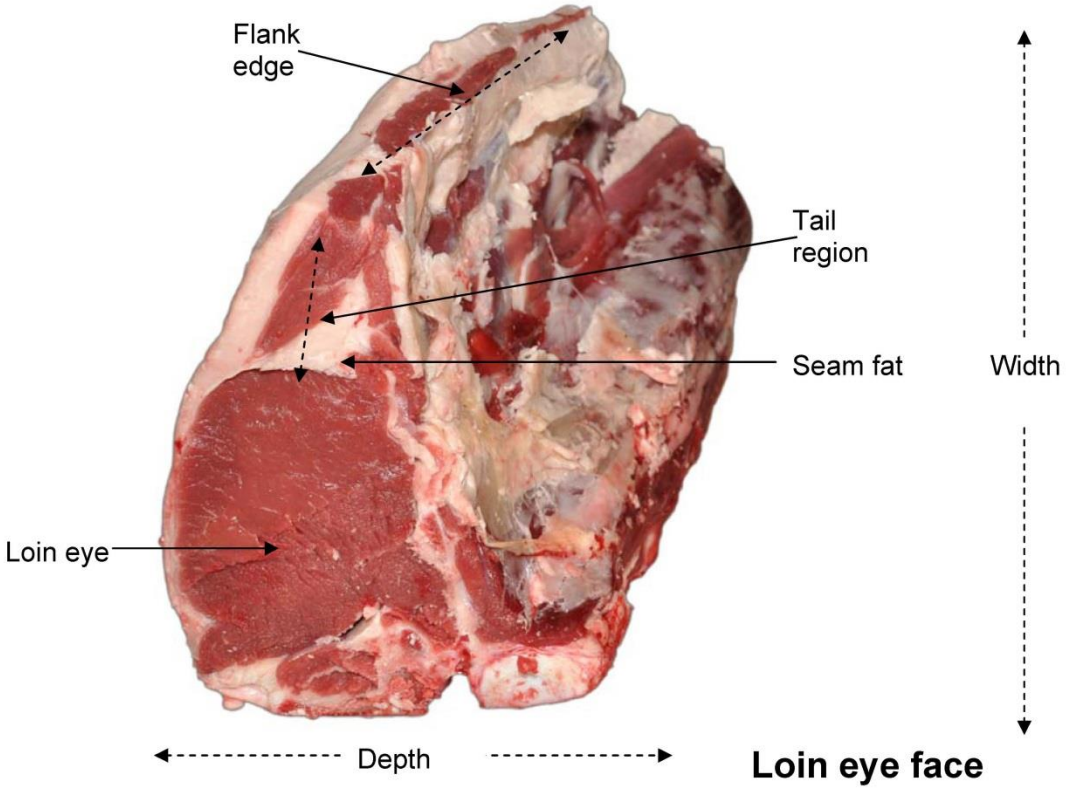
Areas of evaluation for shortloins:

- Loin eye – muscularity, trimness, quality
- Sirloin face – quality, muscularity, trimness
- Back - muscularity
- Top Loin and Tenderloin - muscularity
- Loin edge – external trimness
- Flank – external trimness

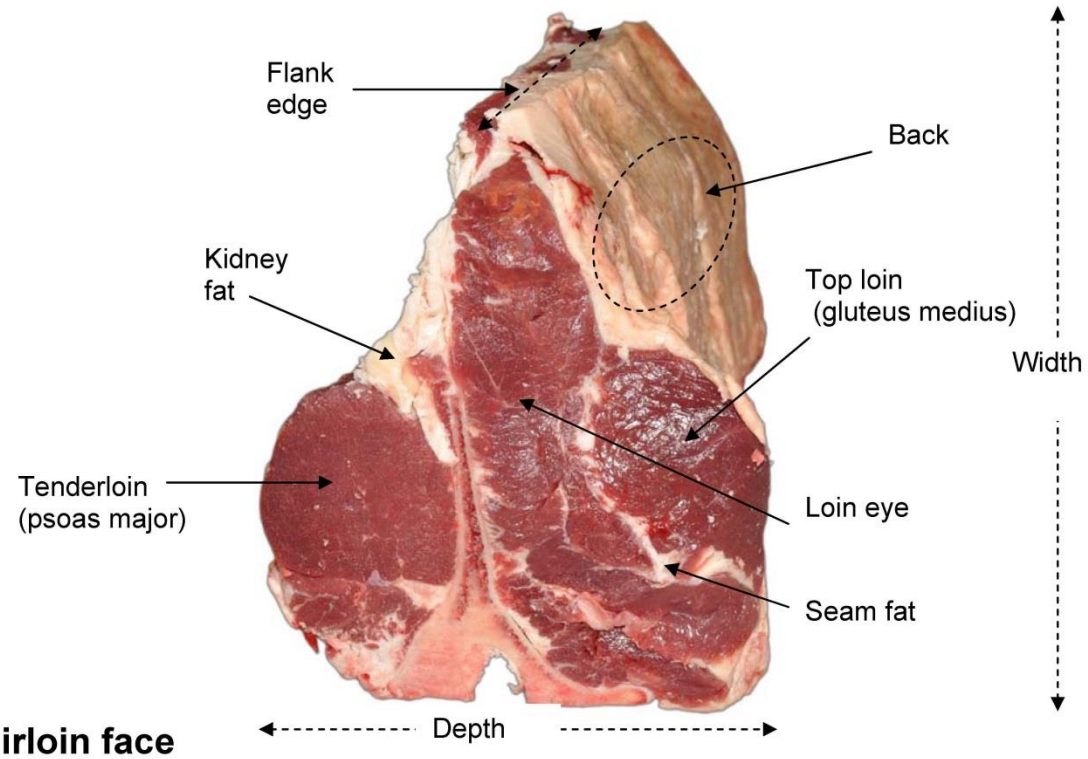
ICMJ Beef Shortloin Judging YouTube **https://www.youtube.com/watch?v=TAeDF-23YOg**

Muscling	Trimness	Quality
Loin eye Larger More symmetrically shaped **Sirloin face** Greater area of exposed lean Deeper Wider Meatier Larger **Back** Plumper Wider More muscular Fuller Longer **Tenderloin** Larger	**Less fat over the:** • Loin eye • Sirloin face (top and bottom) • Back • Flank edge Less seam fat in the sirloin face Less kidney fat	**Marbling in the loin eye and sirloin face** • Higher degree • Greater amount • More finely dispersed **Colour of lean in loin eye and sirloin face** • Brighter • More youthful • More cherry red **Firmer lean in loin eye and sirloin face** **Finer textured lean in loin eye and sirloin face** **Fat** Whiteness Firmness

Beef shortloin terminology



Loin eye face



Sirloin face

Examples of questions used for shortloin evaluation classes in ICMJ contest

2016

1. Which shortloin displays the largest loin eye in the loin eye face?
2. Which shortloin has the least amount of kidney fat?
3. Between 2 and 3, which shortloin has the lighter coloured lean in the loin eye face?
4. Which shortloin has the smallest loin eye in the sirloin face?
5. Which shortloin has the most fat along the flank edge?
6. Between 2 and 3, which has the larger tenderloin?
7. Which shortloin has the largest gluteus medius?
8. Between 1 and 3, which has the greater degree of marbling in the loin eye face?
9. Which shortloin is the least muscular over the back?
10. Which shortloin has the least amount of trimmable fat over the sirloin face?

2015

1. Between 1 and 2, which has the most exposed lean in the sirloin face?
2. Between 1 and 2, which has the most exposed lean in the sirloin face?
3. Between 1 and 2, which has the most exposed lean in the sirloin face?
4. Between 3 and 4, which is the leanest along the flank edge?
5. Which shortloin is trimmest over the tail region?
6. Between 1 and 2, which displayed the highest degree of marbling in the loin eye face?
7. Which shortloin displayed the largest top loin (gluteus medius) in the class?
8. Between 3 and 4, which displayed the larger tenderloin?
9. Between 3 and 4, which has the more desirable meat colour in the loin eye face?
10. Which shortloin has the most kidney fat?

2.8.4 Beef ribs

Emphasis: Quality followed by yield and trimness

The ribs are another high value primal for the Australian and export markets.

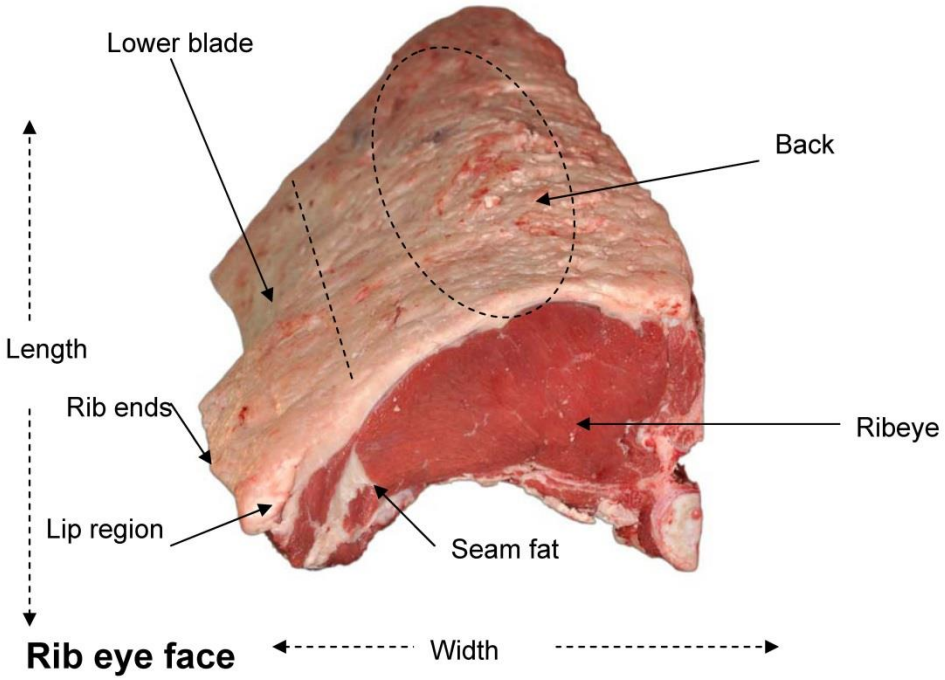
Areas of evaluation for rib sets

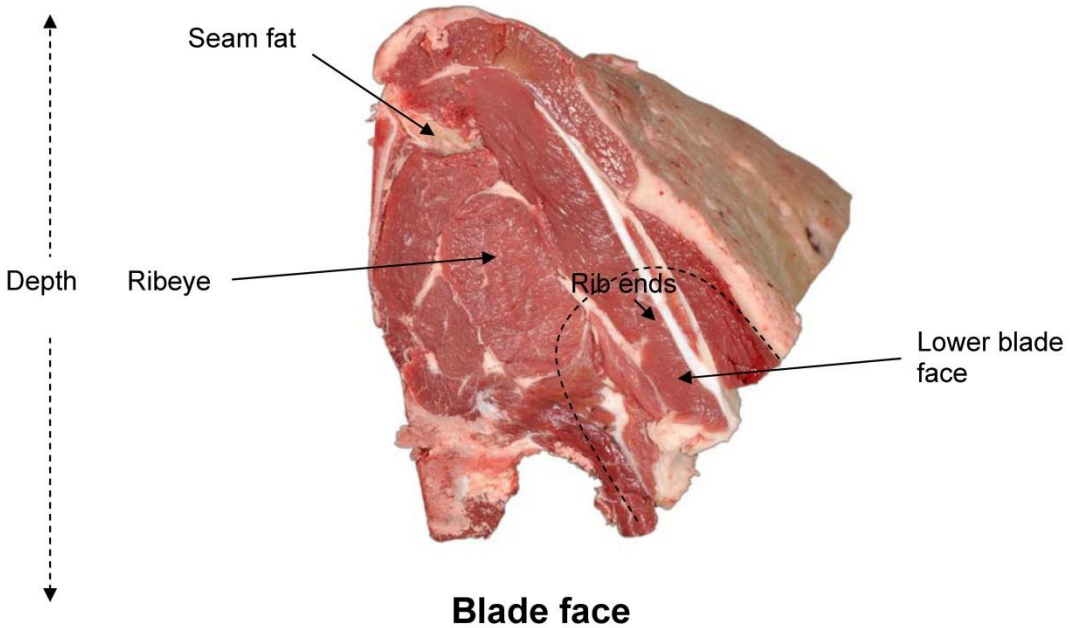
- Rib eye – muscularity, external trimness, quality
- Blade face – quality, muscularity, trimness
- Rib ends – external trimness
- Back – trimness and yield
- Flank – external trimness

Evaluation terminology for rib sets

Muscling	Trimness	Quality
Rib eye Larger More symmetrically shaped **Blade face** Greater area of exposed lean Deeper Wider Meatier Larger eye of the blade face **Back** Plumper Wider More muscular Fuller Longer	**Less fat over the:** • Rib eye • Lower rib • Blade face • Back • Rib ends • Lower blade Less seam fat in the blade face	**Marbling in rib eye and blade face** • Higher degree • Greater amount • More finely dispersed **Colour of lean in rib eye and blade face** • Brighter • More youthful • More cherry red **Firmer lean in rib eye and blade face** **Finer textured lean in rib eye and blade face** **Fat** Whiteness Firmness

Beef ribset terminology





Examples of questions used for rib set evaluation classes in ICMJ contest

2014

1. Between primals 1 and 2, which was the deepest through the blade face?
2. Between primals 1 and 2, which was the deepest through the blade face?
3. Between primals 1 and 4, which had the most fat over the ribeye face?
4. Which primal had the smallest ribeye in the blade face?
5. Between primals 2 and 3, which had the largest ribeye in the ribeye face?
6. Which ribset had the most marbling in the ribeye of the blade face?
7. Which ribset had the most marbling in the ribeye of the blade face?
8. How many ribset's had the feather bones removed?
9. Which primal had the least amount of exposed lean in the blade face?
10. Between 2 and 3, which had the most fat over the lip region?

ICMJ

AUSTRALIAN INTERCOLLEGIATE MEAT JUDGING ASSOCIATION

3.0 Lamb evaluation

Carcases

3.1 Lamb carcase evaluation

There are three broad attributes of a lamb carcase that contribute to its suitability to a given market specification or to a customer's expectation. These are grouped as:

- Trimness
- Muscularity
- Quality

When evaluating carcases according to the above factors, it is important to consider the customer that the carcase will be supplied to. Market specifications are determined by the customer and hence carcases should be produced and evaluated to ensure conformance to the specifications.

There is not any one carcase trait that makes an ideal product. When evaluating carcases, the above attributes should be considered independently and then combined to produce an overall evaluation outcome.

The AUS-MEAT definition of a lamb carcase is, a female or castrate or entire male ovine that has 0 permanent incisor teeth in wear (Check Sheep producers council website for details)

3.2 Lamb carcase yield

The leanness or trimness of a carcase will ultimately influence the yield of that carcase and hence profitability. Leanness will influence time spent trimming a carcase to customer specifications and will affect the saleable retail yield.

The highest yielding carcases are both heavily muscled and lean while the lowest yielding carcases tend to be lightly muscled and over fat or poorly finished and both lean and lightly muscled.
Carcase leanness is influenced by the following factors which require consideration when evaluating a carcase;

- Fat coverage
- Fat distribution
- Sex

3.2.1 Fat coverage

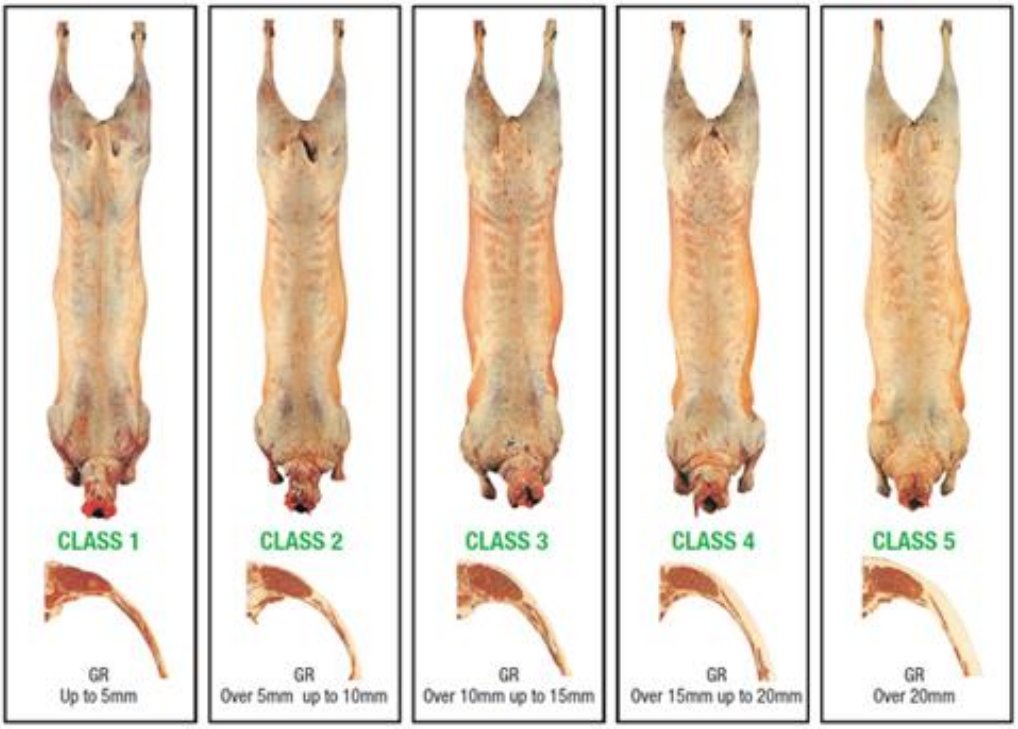
Sufficient fat coverage is necessary on a carcase to:

- Minimise carcase dehydration which can result in yield losses
- Protect muscles from severe chilling regimes that can result in muscle toughening.
- Prevent discolouration (blackening) during prolonged chilled storage

The best indication of carcase fatness is fat depth over the middle of the eye muscle. As this is difficult to measure (or assess), the best practical site for objective measurement is the GR site. The GR site is defined as: ***11 cm from the mid line over the 12th rib (GR site).***

GR measurements then determine the AUS-MEAT fat class a carcase falls into. Figure 18 illustrates the various fat classes, with Class 1 being the leanest and Class 5 the fattest. Carcases of fat score 2 and low 3 would yield the most acceptable subcutaneous fat coverage over retail cuts. These classes would ensure adequate carcase coverage as well as minimal trimming requirements.

AUSMEAT fat classes for sheepmeat



Measuring fat depth at the GR site

3.2.2 Fat distribution

The yield of saleable meat in a carcase is primarily affected by the fatness of the carcase in relation to its weight. The thickness and distribution of external fat on the carcase (subcutaneous fat) is an important factor in carcase yield. At the same weight, a fat carcase will have a lower yield than a leaner carcase.

Other than having a moderate fat cover, carcases should have a normal fat distribution for optimal yields. It is important to be aware that fat is usually deposited last on the leg and shoulder. Points on the carcase to assess include:

- Leg and shoulder – ideally a light cover (light bluish colour rather than thick white fat)
- Flank and breast – will generally see heavier deposits
- Tail (dock) – fat lambs will exhibit a deep fat deposit
- Leg and chump junction
- Kidney and pelvic fat - excess channel fat will reduce the yield of a lamb carcase

3.3 Lamb carcase muscularity

Muscularity of lamb carcases can aid in yield assessment and can potentially be important in determining the saleability of cuts due to shape and size.

Therefore, if two carcases have the same apparent fat measurements and carcase weights the more heavily muscled carcase in the major primal cuts would be more desirable.

Main areas for assessment of carcase muscularity (thickness and depth) include:

- Leg and chump - well developed muscle will be displayed through thick and bulging legs, evaluated from front and side observations.
- Loin – good loin eye development will be evident through a well-rounded loin
- Shoulder – ideally should be well muscled down onto the breast
- Ribs – good muscularity will be shown through well fleshed ribs

It is important when assessing muscularity, that this is not confused with the fatness of the carcase.

3.4 Lamb carcase quality

Regardless of leanness and muscling, quality is of paramount importance when assessing carcases for a customer specification.

In lamb carcases, a limited number of quality factors can be assessed and include:

- Fat colour
- Fat properties (firmness)
- Meat colour

3.4.1 Fat colour

White or creamy white fat is most desirable, however variation in fat colour of lamb carcases tends not to be a significant problem in the Australian domestic market.

Fat colour will not affect eating quality of sheepmeat, but can influence the eye appeal to consumers as a retail cut.

3.4.2 Fat properties

As with beef carcases and primals, the fat should be firm on the chilled carcase. Fat on lamb carcases can range from being dry and firm to exhibiting flaky characteristics through to being soft and oily, which is undesirable.

Assessment of meat quality of a lamb is somewhat limited but can be predicted by assessing the degree of feathering between the ribs. Feathering can be described as the white streaks of fat between the rib bones. A high degree of feathering is an indication of high marbled lean within the carcase.

3.4.3 Meat colour

As lamb carcases are not quartered at the rib eye for assessment, meat colour assessment is limited to the flank and thoracic areas.

A bright reddish pink is the most desirable meat colour. Dark colour is undesirable to consumers and can indicate poor eating quality. An explanation of the important of meat colour can be found in the beef carcase evaluation section.

3.5 Lamb carcase evaluation

Emphasis: Yield (muscularity and leanness) followed by quality

Areas of evaluation for lamb carcases

- Leg
- Chump
- Loin
- Shoulder
- Dock
- Flank
- Kidney and pelvic area
- Breast

When judging a lamb carcases class, please take into consideration Meat Standards Australia (MSA) minimum requirements for Lamb and Sheepmeat.

If a carcase is judged to have a fat score 1 (one), it therefore fails MSA minimum requirements and should be placed last in the class. This is because it may not met the consumer expectations for eating quality attributes of tenderness, juiciness and flavour. Reduced fat cover over the carcases may lead to cold shortening issues.

Please refer to the "Lamb fat Distribution" document for further information.

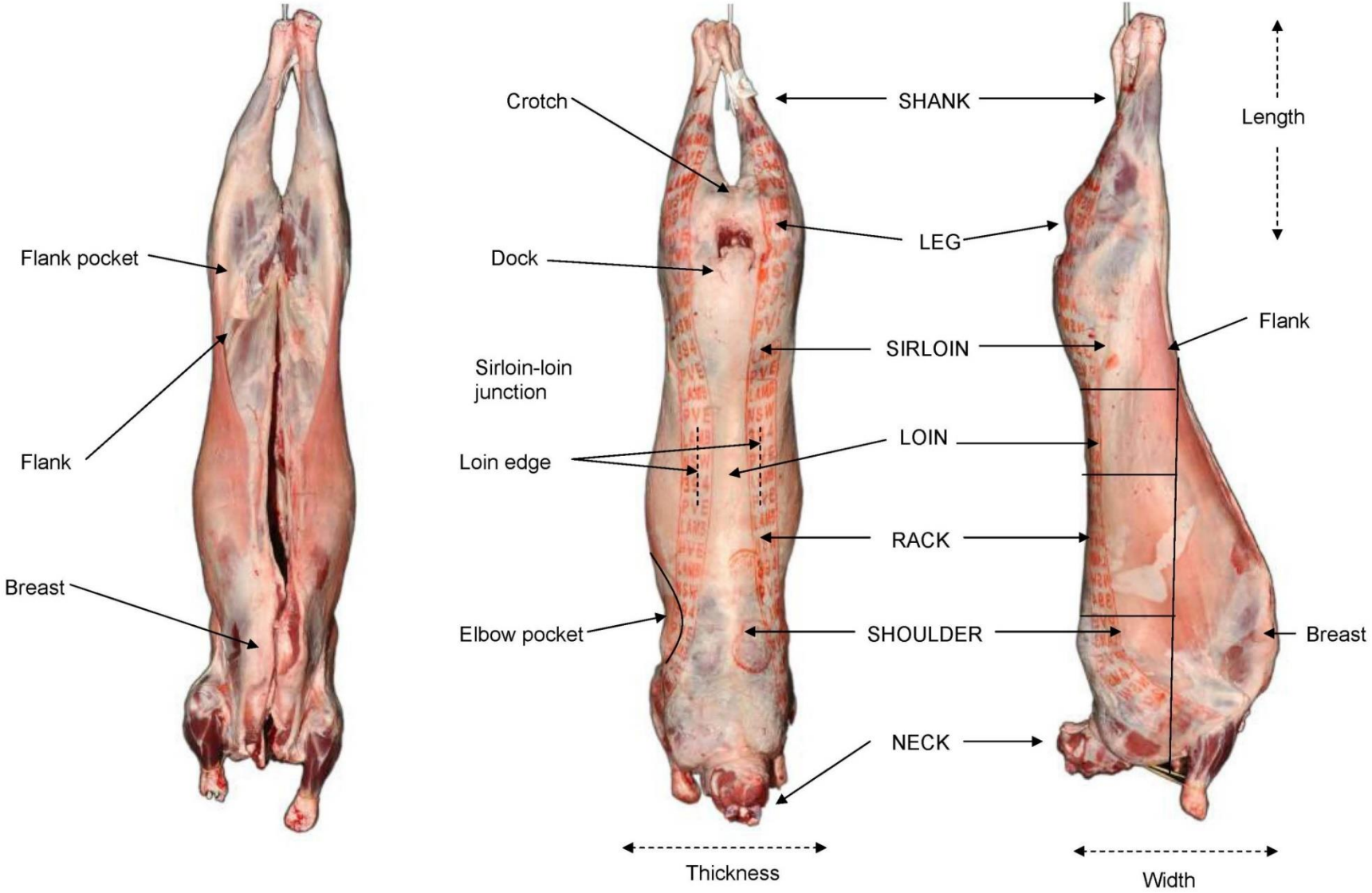
http://icmj.com.au/wp-content/uploads/2017/01/Lamb-Fat-Distribution-Document.pdf

Carcass specifications				
Category/ Cipher	**Dentition (permanent incisors)**	**HSCW**	**Fat score**	**GR**
Young Lamb ***YL***	0 (in addition); has no eruption of permanent upper molar teeth. Up to 5 months only	≥ 16kg	≥ 2	≥6mm
Lamb ***L***	0 12 months approximately	≥ 18kg	≥ 2	≥6mm
Hogget ***H***	1-2	≥ 18kg	≥ 2	≥6mm
Mutton ***M***, ***W***, ***E***	1-8	≥ 18kg	≥ 2	≥6mm

Evaluation terminology for lamb carcases

Muscling	Trimness	Quality
Leg Thicker Wider Longer Plumper More bulging More muscular **Sirloin** More prominent Thicker Plumper More bulging Fuller More muscular **Loin** Thicker Fuller More muscular **Rack** Thicker Fuller More muscular **Shoulder** Thicker Wider Deeper More muscular More bulging **Shank** Shorter	**Less fat over the:** • Loin • Loin edges • Leg • Sirloin • Rack • Shoulder • Dock • Breast • Flanks • Elbow pockets • Crotch	**Flank streaking** Greater amount More extensive **Lean** Colour in flank region Brighter More youthful More reddish pink **Ribs** Feathering Redder Rounder **Fat colour** Firmer Whiter

Lamb carcase terminology



Examples of questions used for lamb carcase evaluation classes in ICMJ contest

2017

1. Which carcase was fattest over the dock?
2. Which was the highest yielding carcase in the class?
3. Between 1 & 2, which carcase displayed the most fat in the crotch region?
4. Between 1 & 3, which carcase had the narrowest, least muscular shoulder?
5. Which carcase had the poorest muscled leg?
6. Which carcase displayed the most blueing over the leg and loin?
7. Between 2 & 4, which carcase displayed the most fat in the flank pocket?
8. Between 1 & 3, which carcase had the least fat over the breast?
9. Which carcase displayed the reddest, roundest ribs?
10. Which carcase had the lightest coloured lean in the flank region?

2016

11. Which lamb has the least crotch fat?
12. Which is the highest yielding carcase in the class?
13. Between 1 & 4, which carcase is trimmer over the breast?
14. Which carcase is fattest over the loin?
15. Which carcase has the greatest degree of secondary flank streaking?
16. Between 2 & 3, which carcase has more muscling through the loin and rack?
17. Which carcase has the reddest roundest ribs?
18. Which carcase is trimmest through the flank pocket?
19. Between 3 & 4, which carcase is fatter over the dock?
20. Which carcase is trimmest over the sirloin?

2015

1. Which carcase had the most fat over the dock and sirloin?
2. Between 1 and 4, which carcase had the most fat in the crotch region?
3. Between 3 and 4, which carcase was trimmest over the loin, rack and shoulder?
4. Which carcase displayed the most secondary flank streaking?
5. Which was the highest yielding carcase in the class?
6. Between 1 and 4, which carcase was fattest over the breast?
7. Which carcase displayed the least cod and udder fat?
8. Which carcase displayed the reddest, roundest, most youthful coloured ribs?
9. Between 1 and 2 which carcase has the thinnest least muscular shoulder?
10. Between 3 and 4, which carcase has the most defined loin edge?

2014

1. Between 1 and 4, which carcase was fattest in the dock and sirloin regions?
2. Which carcase would yield the highest percentage of closely trimmed retail cuts?
3. Which carcase displayed the most fat in the flank pocket and flank region?
4. Between 1 and 4, which carcase had the thickest, plumpest, most muscular shank?
5. Between 2 and 3, which carcase displayed the reddest, roundest, most youthful ribs?
6. Between 2 and 3, which carcase displayed the most flank streaking?
7. Between 3 and 4, which carcase displayed the most fat and least definition through the sirloin and loin?
8. Between 3 and 4, which carcase displayed the most fat and least definition through the sirloin and loin?
9. Which carcase displayed the most feathering in the class?
10. Between 1 and 4, which carcase displayed the greatest degree of blueing over the shoulder?

Examples of questions used for lamb *reasons* classes in ICMJ contest

2017

1. Describe the muscling differences between carcases 2 & 3
2. Describe the trimness differences between carcases 2 & 3
3. Describe the areas in which carcase 1 was trimmer than carcase 3
4. Describe the trimness and quality advantages of carcase 4 over carcase 1
5. Which carcase did you place last and why?

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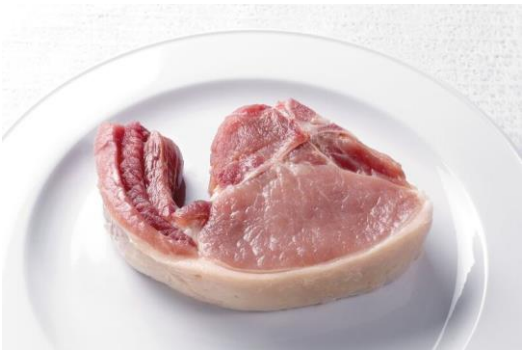


4.0 Pork evaluation

Carcases and primals

4.1 Pork carcase evaluation

There are attributes of a pork carcase that contribute to its suitability to a given market specification or to a customer's expectation. These are grouped as:

- Yield (trimness and muscling)
- Eating Quality

When evaluating carcases according to the above factors, it is important to consider the customer that the carcase will be supplied to. Market specifications are determined by the customer and hence carcases should be produced and evaluated to ensure conformance to the specifications.

There is not any one carcase trait that makes an ideal product. When evaluating carcases, the above attributes should be considered independently and then combined to produce an overall evaluation outcome.

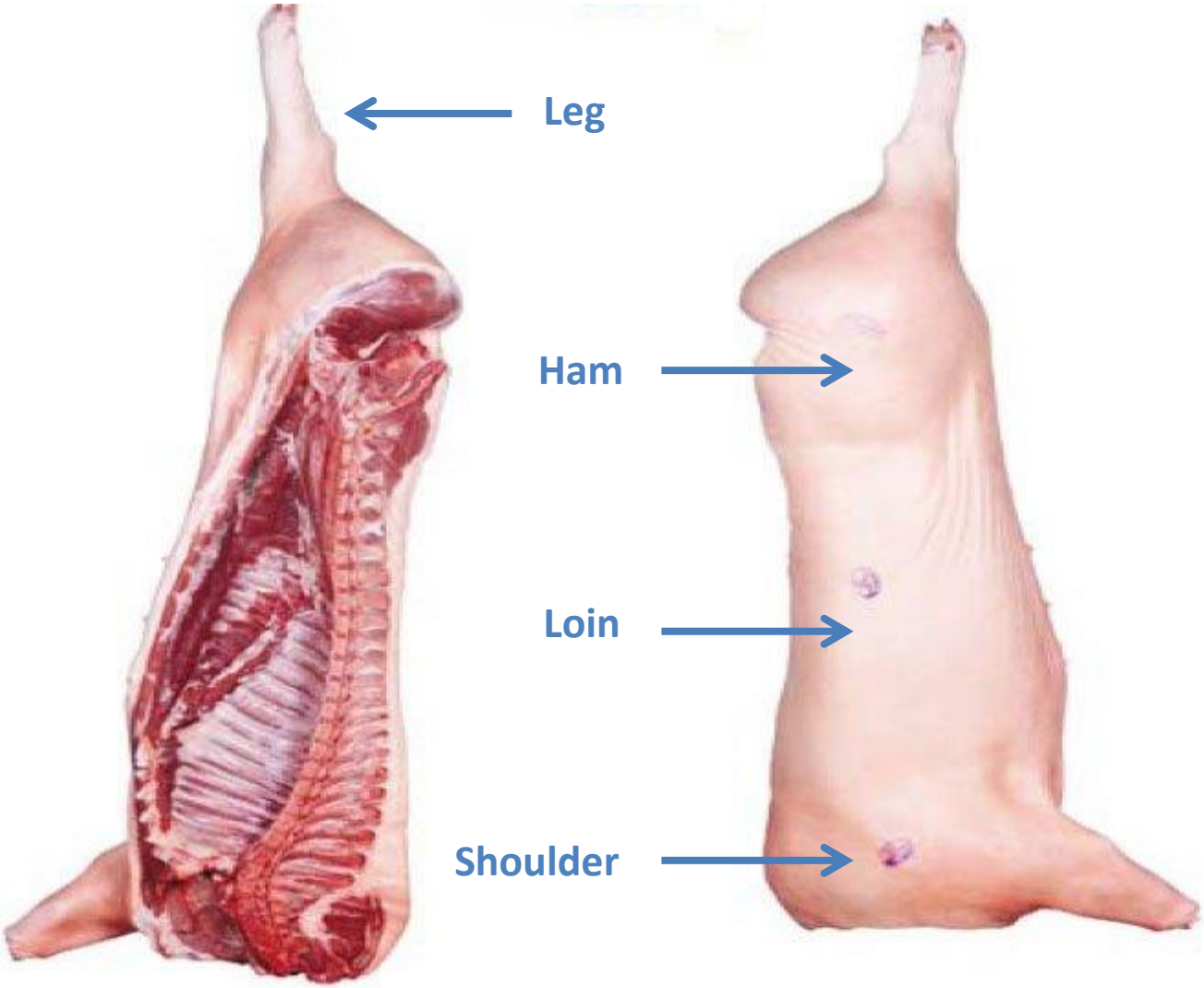
4.2 Pork carcase muscularity

Muscularity of pork carcases can aid in yield assessment and can potentially be important in determining the saleability of cuts due to shape and size.

It is important to be able to distinguish between the thickness, plumpness and firmness of a carcase is due to muscle development rather than fat deposition.

Main areas for assessment of carcase muscularity include:

- Legs
- Hams
- Loin
- Shoulder



The following table provides an indication of the difference in carcase attributes between thick and thin muscularity:

Assessment of pork carcase muscularity

Point of assessment	This muscling/ low fatness	This muscling/ high fatness	Average muscling	Thin muscling/ low fatness	Thin muscling/ high fatness
Legs	Thicker than loin	Slightly thicker than loin	Equal thickness through legs and loin	Thicker in centre of legs than loin	Thinner than loin
Loin	Appear full and well-rounded	Flat over the loin		Appear sloping and flat	Thicker than legs
Shoulder				Thicker than loin	

It is more desirable to produce carcases with thick muscling and low fatness to yield the highest percentage of saleable retail cuts that require minimal trimming.

4.3 Pork carcase trimness

The trimness of a pork carcase, in particular external fat will ultimately influence the yield of that carcase and hence profitability. Leanness will influence time spent trimming a carcase to customer specifications and will affect the saleable retail yield.

The highest yielding carcases are both heavily muscled and lean while the lowest yielding carcases tend to be lightly muscled and over fat or poorly finished and both lean and lightly muscled.

The following areas are points to evaluate when assessing a carcase for trimness in determining the ability of the carcase to yield the greatest amount of lean saleable retail cuts:

- Collar fat - on the inside of the leg area
- Internal belly edge – fat thickness
- Sternum – fat thickness

4.4 Pork carcase quality

In pork carcases, a limited number of quality factors can be assessed as carcases in the Australian ICMJ contest are left entire (i.e. not split or quartered)

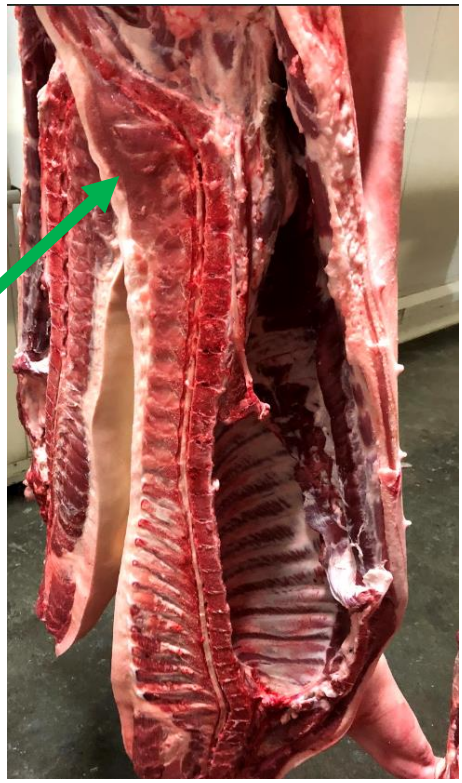
- Meat colour and texture
- Fat properties of external fat coverage
- Skin
- Meat quality (intramuscular fat)

4.4.1 Meat colour and texture

The colour and texture of the exposed lean sometimes visible in the collar area should be:

- Fine textured.
- A bright greyish pink colour is highly desirable.
- Pale coloured soft watery lean is severely criticised.
- Dark coloured lean is undesirable.

In a carcase, the lean can be assessed by viewing the lumbar lean or exposed lean around the collar.
Pork carcases can exhibit a meat quality phenomenon called PSE (pale, soft and exudative meat). PSE meat also is a problem at retail as it exudes large volumes of drip in the retail pack, which is unsightly to the consumer. Also from the food service perspective, the yield of PSE meat is lower when cooked. PSE meat is a major problem in pig meat.



Lumbar lean

4.4.2 Fat Properties

The exterior fat covering should be:

- Firm
- White coloured
- Dry to touch
- Dry in appearance
- Soft oily and discoloured fat is undesirable

4.4.3 Skin

The skin of a high quality pork carcase should be smooth and fine grained.

4.4.4 Meat quality

Assessment of meat quality of a pork carcase is somewhat limited but can be predicted by the assessing the degree of feathering between the ribs. Feathering can be described as the white streaks of fat in the meat between the bones.

A high degree of feathering is an indication of high quality marbled lean within the carcase.

4.5 Determining gender of pork carcases

4.5.1 Male

- Rough fat surface in the naval edge and the belly pocket along the split edge of the body where the preputial sheath was removed.
- Larger exposure of collar fat where scrotum has been removed.

4.5.2 Female (gilt)

- Smooth fat surface in the naval edge and belly pocket along the split edge of the belly

Female

Male

4.6 Pork carcase evaluation

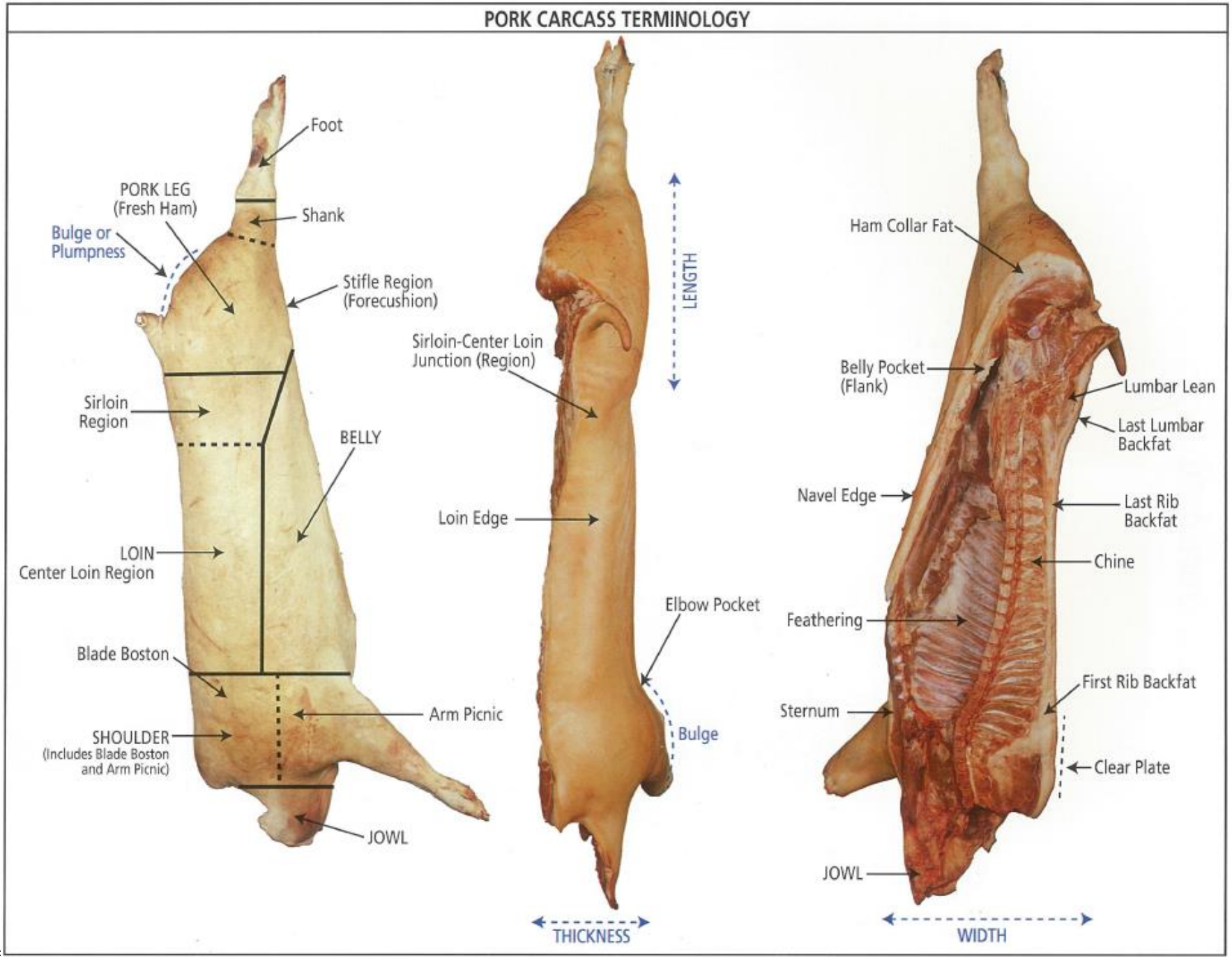
Emphasis: Yield (muscularity and trimness) followed by quality

Areas of evaluation for pork carcases

- Ham
- Sirloin
- Mid-loin
- Rib-loin
- Shoulder
- Belly
- Butt collar
- Ribs

Evaluation terminology for pork carcases

Muscling	Trimness	Quality
Ham Thicker Wider Longer Plumper More bulging More muscular **Sirloin** More prominent Thicker Plumper More bulging Fuller More muscular **Mid loin** Thicker Fuller More muscular **Rib Loin** Thicker Fuller More muscular **Shoulder** Thicker Wider Deeper More muscular More bulging **Shank** Shorter	**Less fat over the:** • Collar • Belly pocket • Navel edge • Sternum	**Ribs** Feathering **Lean** Firmer Brighter


PORK CARCASS TERMINOLOGY
Foot
PORK LEG
(Fresh Ham)
Shank
Bulge or
Plumpness
Stifle Region
(Forecushion)
Sirloin
Region
BELLY
LOIN
Center Loin Region
Blade Boston
Arm Picnic
SHOULDER
(Includes Blade Boston
and Arm Picnic)
JOWL
Sirloin-Center Loin
Junction (Region)
LENGTH
Loin Edge
Elbow Pocket
Bulge
THICKNESS
Ham Collar Fat
Belly Pocket
(Flank)
Lumbar Lean
Last Lumbar
Backfat
Navel Edge
Last Rib
Backfat
Chine
Feathering
First Rib Backfat
Sternum
Clear Plate
JOWL
WIDTH

Examples of questions used for pork carcase evaluation classes in ICMJ contest

2017

1. Which carcase was fatter over the lumbar lean?
2. Between carcase 1 & 3, which had the largest *Gluteus medius* muscle?
3. Which carcase displayed the least amount of fat along the navel edge?
4. Between 1 & 2, which carcase had the plumper, fuller ham partially due to fat?
5. Which carcase had the most shapely, heavily muscled loin?
6. Which carcase displayed the amount of feathering?
7. Which carcase was the lowest yielding?
8. Which carcase had the most fat in the elbow pocket?
9. How many gilts in the class?
10. Between 3 & 4, which carcase had the plumper, more muscular, bulging shoulder?

2016

11. Which carcase has the greatest area of lumbar lean?
12. Which carcase is the highest yielding?
13. Between 1 & 4 which carcase has the more muscular bulging ham?
14. Between 2 & 3, which carcase is trimmer over the 1st rib?
15. Which carcase is fattest down the navel edge and sternum?
16. Between 1 & 2, which carcase has the leanest most defined sirloin/loin junction?
17. Which carcase is leanest over the clear plate?
18. Which carcase is trimmest over the last lumbar?
19. How many gilts in the class?
20. Between 2 & 3, which carcase has a greater amount of feathering between the ribs?

2015

1. Which carcase is fattest through the naval edge and belly pocket?
2. Between 1 and 4, which carcase has the fuller more muscular ham?
3. Which carcase is leanest alongside the lumbar lean?
4. Between 2 and 3, which is trimmest at the last rib?
5. Between 1 and 2, which displays the least amount of fat in the collar region?
6. Which carcase has the most feathering?
7. Which carcase will produce the highest percentage of closely trimmed retail cuts?
8. Which carcase is fattest over the clear plate?
9. How many gilts are in the class?
10. Between 2 and 3, which has the plumper more muscular bulging shoulder?

2014

1. Between 2 and 4, which carcase had the most fat at the first rib?
2. Which carcase had the greatest area of exposed lumbar lean?
3. How many males were in the class?
4. How many males were in the class?
5. Which carcase had the flattest, lightest muscled shoulder?
6. Which carcase had the flattest, lightest muscled shoulder?
7. Which carcase displayed the least amount of fat along the navel edge?
8. Between 1 and 3, which carcase was trimmer at the last rib?
9. Which carcase displayed the least amount of feathering?
10. Which carcase had the most fat in the belly pocket?

4.7 Pork primal evaluation

When carcases are boned, they are broken down into primals. The same broad attributes that are used in carcase evaluation are also used when appraising pork primals. These are grouped as:

- Yield (trimness and muscling)
- Eating quality

Importantly, there are differences between the evaluation of primals within a carcase. This difference is dependent on the relative market value of each primal and therefore the importance of quality and yield for each primal.

There is not any one trait that makes an ideal product. When evaluating beef primals, the above attributes should be considered independently in combination with the market suitability of the individual primal.

Key points for evaluating/judging pork primals

You MUST know your primal face names – they will be used during questions and important when writing reasons.

4.7.1 Fresh Hams (Pork Legs)

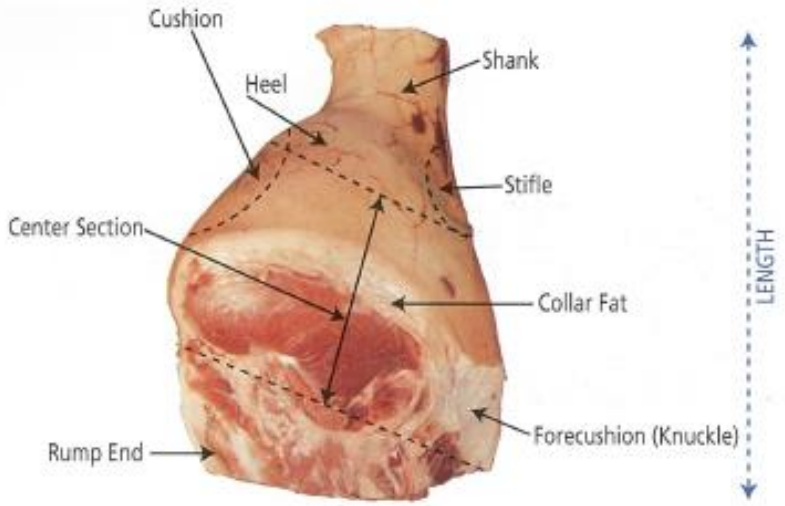
Emphasis: Yield (muscling plus trimness) followed by quality

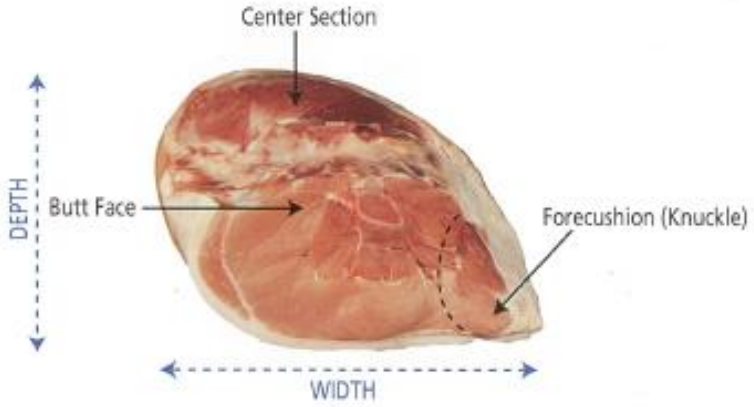
Areas of evaluation:

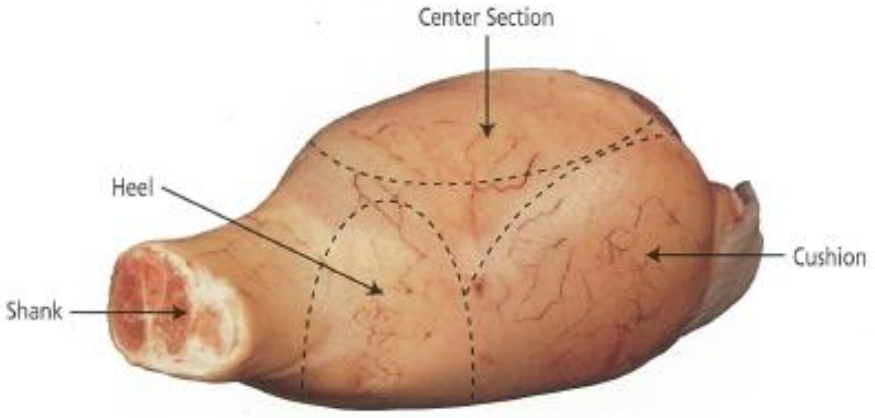
- Centre section – muscularity and depth
- Forecushion – Trimness
- Butt face – exposed lean
- Heel – muscling and trimness
- Stifle - muscling and trimness

Trimness	Muscling	Quality
Less fat over/along/under: Forecushion Butt face **Less seam fat in the butt face** **Less collar fat**	**Centre section** Larger Plumper Deeper Broader **Cushion** Deeper Broader **Heel** Plumper **Butt face** Deeper Wider Meatier Comparative size of exposed muscles	Colour of the lean in the butt face, secondary muscles • More reddish pink • Less two toned Firmer lean in the Butt face More marbling in the butt face **Texture** Coarse and stringy Firm and fine **Fat** Whiteness Firmness

PORK LEG (FRESH HAM) TERMINOLOGY







Examples of questions used for fresh ham evaluation classes in ICMJ contest

2015

1. Which ham has the most collar fat?
2. Which ham has the most marbling in the exposed face?
3. Which primal displays the least uniform/most variation in meat colour in the butt face?
4. Which ham has the firmest and most favourably textured lean?
5. Which is the highest yielding ham?
6. Which ham has the most fat over and alongside the butt face?
7. Between 2 and 4, which ham has the more muscular cushion?
8. Which ham is trimmest over and alongside the forecushion?
9. Which ham has the most seam fat in the butt face?
10. Which ham is leanest in the heel section?

2014

1. Which ham displayed the firmest lean in the butt face?
2. Between 1 and 3, which ham had the deepest, plumpest centre section?
3. Between 1 and 3, which had the plumper more muscular heel?
4. Which ham would be the highest yielding in the class?
5. Between 2 and 4, which ham displayed the least collar fat?
6. Which ham had the shortest shank in the class?
7. Between 1 and 3, which displayed the least fat over the forecushion?
8. Between 2 and 4, which ham displayed a deeper, wider centre section, partially due to fat?
9. Between 2 and 4, which ham displayed the most fat over the forecushion?
10. Between 1 and 3, which ham displayed the finest textured lean in the butt face?

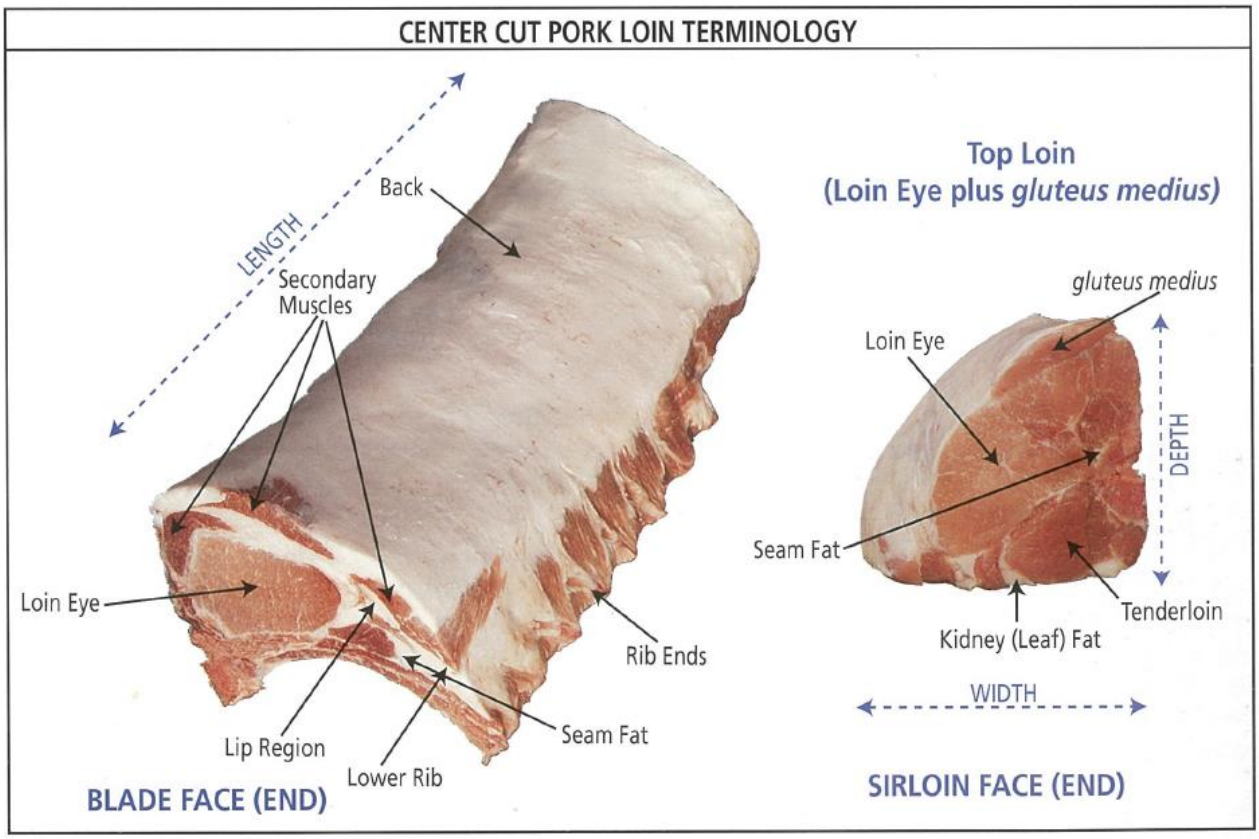
4.7.2 Evaluating Pork Loins (Centre Cut)

Emphasis: Yield (muscling plus trimness) followed by quality

Areas of evaluation:

- Blade face – muscularity, trimness and quality
- Chine – muscularity
- Back – muscularity and trimness
- Rib ends – trimness
- Sirloin face - muscularity, trimness and quality

Trimness	Muscling	Quality
Less fat over the: Blade face Back Lower rib Rib ends Sirloin face **Less seam fat in the blade and sirloin faces** **Less fat in the lip region** **Less kidney fat**	**Blade face** More exposed lean Deeper or wider Loin eye – larger, more symmetrically shaped Secondary muscles – larger **Back** Deeper chined Wider backed Longer loin **Sirloin face** More exposed lean Deeper or wider Gluteus medius - larger Loin eye – larger Tenderloin – larger	Colour of lean in the loin eye (both faces), secondary muscles, gluteus medius, tenderloin or entire faces · More reddish pink · Less two toned Firmer lean in the loin eye (both faces), secondary muscles, gluteus medius, tenderloin or entire faces (blade or sirloin) Finer lean in the loin eye (both faces), secondary muscles, gluteus medius, tenderloin or entire faces (blade or sirloin) More marbling in the loin eye (both faces), secondary muscles, gluteus medius, tenderloin or entire faces (blade or sirloin) **Fat** Whiteness Firmness


CENTER CUT PORK LOIN TERMINOLOGY
LENGTH
Back
Secondary Muscles
Loin Eye
Rib Ends
Seam Fat
Lip Region
Lower Rib
BLADE FACE (END)
Top Loin
(Loin Eye plus gluteus medius)
gluteus medius
Loin Eye
DEPTH
Seam Fat
Tenderloin
Kidney (Leaf) Fat
WIDTH
SIRLOIN FACE (END)

Examples of questions used for pork loin evaluation classes in ICMJ contest

2017

1. Which loin displays the least area of exposed lean in the sirloin face?
2. Which loin combined trimness and muscling to the lowest degree?
3. Which loin was trimmest over the back?
4. Which loin displayed the most marbling in the secondary muscles of the blade face?
5. Between 1 & 4, which loin displayed the least fat over the lower sirloin face?
6. Which loin displayed the most kidney face in the sirloin face?
7. Between 2 & 3, which loin had the largest *Gluteus medius* in the sirloin face?
8. Which loin had the most fat over the back and sirloin face?
9. Between 1 & 4, which displayed the most uniform colour in the blade face?
10. Between 4 & 3, which loin was higher yielding?

2016

1. Which loin displays the largest gluteus medius in the sirloin face?
2. Which loin has the largest tenderloin in the class?
3. Which loin has the greatest amount of marbling in the loin eye of the sirloin face?
4. Between loins 3 and 4, which loin has the greatest area of exposed lean in the blade face?
5. Which loin has the smallest secondary muscles in the blade face?
6. Which loin has the softest lean in the blade face?
7. Between 3 & 4, which loin has the greatest amount of seam fat in the blade face?
8. Between loins 2&4, which displayed the least kidney fat?
9. Which loin is the trimmest over the back?
10. Between 2&3, which loin showed the least uniform colour in the blade face?

2013

1. Between primal 1 and 2, which is trimmer over both the blade and sirloin faces?
2. Between primals 1 and 3, which has the least fat over the back?
3. Which primal exhibits the most seam fat in the blade face?
4. Between primals 1 and 2, which is more muscular through the back?
5. Which displays the least desirable lean texture in the blade face?
6. Between primals 1 and 2, which has the smallest Gluteus Medius in the sirloin face?
7. Which primal has the most kidney fat?
8. Which primal would yield the highest percentage of trimmable fat?
9. Between primals 1 and 2, which has the greater area of exposed secondary muscles in the blade face?
10. Which primal has the most marbling in the blade face?

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5.0 Retail cut identification

Beef, Lamb and Pork

There are three (3) answer areas required for the Retail cut identification class. These are:

- Species (Beef, Lamb or Pork)
- The retail cut name (e.g. Rump steak), and
- The primal name from which the retail cut was derived (e.g. Rump)

Students will have 15 minutes to assess, identify and answer 25 retail cuts.

*(Please note: students will **NO** longer be required to identify a cook method)*

5.1 Beef retail cut identification

SPECIES	RETAIL CUT	PRIMAL
Beef	Rump Steak	Rump
Beef	Rump Cap Steak	Rump Cap
Beef	Fillet Steak	Tenderloin
Beef	Ribeye Steak	Cube Roll
Beef	Rib Steak Bone-in	Rib set
Beef	T-Bone Steak	Shortloin
Beef	Sirloin Steak Bone In	Shortloin
Beef	Sirloin Steak Boneless	Striploin
Beef	Oyster Blade Steak	Oyster Blade
Beef	Flat Iron Steak	Oyster Blade
Beef	Flank Steak	Flank
Beef	Round steak	Knuckle
Beef	Topside Steak	Topside
Beef	Silverside Steak	Silverside
Beef	Chuck Steak	Chuck
Beef	Blade Steak Bone In	Blade
Beef	Blade Steak Boneless	Blade
Beef	Short Ribs	Forequarter
Beef	Shin Beef Bone In	Shin
Beef	Shin Beef Boneless	Shin

5.2 Lamb retail cut identification

SPECIES	RETAIL CUT	PRIMAL
Lamb	Mid Loin Chop	Loin
Lamb	Chump Chop	Chump
Lamb	Rib Loin Cutlet	Rib Loin
Lamb	Frenched Rack	Rib Loin
Lamb	Neck Chop	Neck
Lamb	Best Neck Chop	Neck
Lamb	Leg Chop	Leg
Lamb	Fillet	Tenderloin
Lamb	Forequarter Chop	Forequarter
Lamb	Round Steak	Leg
Lamb	Topside Steak	Leg
Lamb	Butterfly Steak	Eye of Loin
Lamb	Round Roast	Leg
Lamb	Topside Roast	Leg
Lamb	Heel Muscle	Leg
Lamb	Eye of loin	Loin
Lamb	Ribs (portioned or whole)	Forequarter
Lamb	Shank	Leg

5.3 Pork retail cut identification

SPECIES	RETAIL CUT	PRIMAL
Pork	Spare Ribs	Belly
Pork	American Ribs	Forequarter
Pork	Belly	Belly
Pork	Scotch Fillet Steak	Collar Butt
Pork	Loin Chop	Loin
Pork	Loin Cutlet	Loin
Pork	Loin Steak	Loin
Pork	Butterfly Steak	Loin
Pork	Rolled Loin Roast	Loin
Pork	Fillet	Tenderloin
Pork	Leg Roast	Leg
Pork	Shoulder Roast	Forequarter
Pork	Forequarter chop	Forequarter

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6.0 Saleable items identification

Beef Primals and Offals

There are three (3) answer areas required for the Saleable items identification class. These are:

- The saleable item name
- The region of the carcase from which the saleable item is located (butt, forequarter, flank, loin, rib set or offal)
- The primal name from which the saleable item was derived

Students will have 15 minutes to assess, identify and answer 25 saleable items.

Name	Region	Primal
Knuckle	Butt	Knuckle
Knuckle centre	Butt	Knuckle
Knuckle Cover	Butt	Knuckle
Topside	Butt	Topside
Topside Cap-off	Butt	Topside
Eye of Topside	Butt	Topside
Flank Steak	Flank	Flap Meat
Internal Flank Plate	Flank	Flap Meat
External Flank Plate	Flank	Flap Meat
Brisket	Forequarter	Brisket
Point End Brisket	Forequarter	Brisket
Navel end Brisket	Forequarter	Brisket
Chuck	Forequarter	Chuck
Chuck Square Cut	Forequarter	Chuck
Neck	Forequarter	Chuck
Chuck roll	Forequarter	Chuck
Chuck Crest	Forequarter	Chuck
Shin-Shank	Butt or Forequarter	Shin-Shank
Chuck Tender	Forequarter	Blade
Knuckle	Butt	Knuckle
Knuckle centre	Butt	Knuckle
Knuckle Cover	Butt	Knuckle
Topside	Butt	Topside
Topside Cap-off	Butt	Topside
Eye of Topside	Butt	Topside
Flank Steak	Flank	Flap Meat
Internal Flank Plate	Flank	Flap Meat
External Flank Plate	Flank	Flap Meat
Brisket	Forequarter	Brisket
Point End Brisket	Forequarter	Brisket
Navel end Brisket	Forequarter	Brisket
Chuck	Forequarter	Chuck
Chuck Square Cut	Forequarter	Chuck
Neck	Forequarter	Chuck

Name	Region	Primal
Chuck roll	Forequarter	Chuck
Chuck Crest	Forequarter	Chuck
Shin-Shank	Butt or Forequarter	Shin-Shank
Chuck Tender	Forequarter	Blade
Blade	Forequarter	Blade
Bolar Blade	Forequarter	Blade
Oyster Blade	Forequarter	Blade
Cube Roll	Forequarter	Cube Roll
Cube Roll Plate	Forequarter	Cube Roll
Rib Eye Muscle	Forequarter	Cube Roll
Shortloin	Loin	Shortloin
Striploin	Loin	Shortloin
Tenderloin	Loin	Tenderloin
Butt Tender	Butt	Tenderloin
Short Ribs	Rib Set	Short Ribs
Intercostals	Rib Set	Intercostals
Rump	Butt	Rump
Tri Tip	Butt	Rump
Rump Cap	Butt	Rump
Rump Centre	Butt	Rump
Eye of Rump	Butt	Rump
Rostbiff	Butt	Rump
D-Rump	Butt	Rump
Silverside	Butt	Silverside
Outside	Butt	Silverside
Outside Flat	Butt	Outside
Heel Muscle	Butt	Silverside
Eye of Round	Butt	Outside

Name	Region	Primal
Heart	Offal	Thoracic Cavity
Pizzle	Offal	Pizzle
Liver	Offal	Liver
Kidney	Offal	Kidney
Tendons	Offal	Tendons
Tripe	Offal	Gastro Intestinal Tract
Large intestine	Offal	Gastro Intestinal Tract
Tongue	Offal	Head
Beef Cheeks	Offal	Head
Rumen Pillar	Offal	Gastro Intestinal Tract
Lungs	Offal	Thoracic Cavity
Small Intestine	Offal	Gastro Intestinal Tract
Head Meat	Offal	Head
Lips	Offal	Head
Tail	Offal	Tail
Spleen	Offal	Gastro Intestinal Tract