Trinity High School
Mathematics Department

National 5
November Test Revision

This booklet contains a mixture of questions covering:

- Fractions
- Percentages
- Pythagoras' Theorem
- Similarity
- Properties of angles and circles
- Expanding brackets and factorising
- Completing the square
- Arcs and sectors
- Volume
- The Straight Line
- Simultaneous Equations*
- Trigonometry* (non-right-angled triangles)

*Denotes topics not yet covered by S5/6 classes. These are examinable for S4 but not for S5/6.

There are answers at the back of the booklet so you can assess yourself.

FORMULAE LIST

The roots of $ax^2 + bx + c = 0$ are $x = \dfrac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Sine rule: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$ or $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

Area of a triangle: $A = \frac{1}{2}ab\sin C$

Volume of a sphere: $V = \frac{4}{3}\pi r^3$

Volume of a cone: $V = \frac{1}{3}\pi r^2 h$

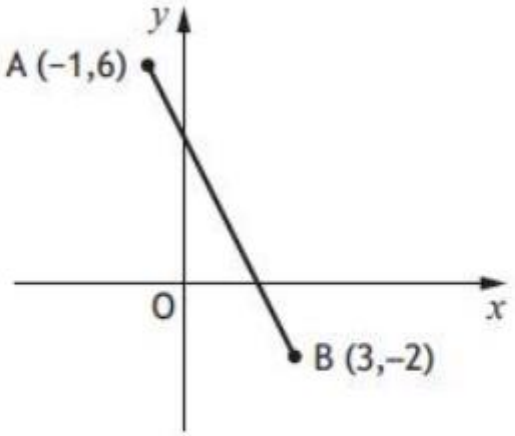
Volume of a pyramid: $V = \frac{1}{3}Ah$

Standard deviation: $s = \sqrt{\dfrac{\Sigma(x - \bar{x})^2}{n - 1}}$

or $s = \sqrt{\dfrac{\Sigma x^2 - \dfrac{(\Sigma x)^2}{n}}{n - 1}}$, where n is the sample size.

1. Evaluate $2\frac{1}{3}+\frac{4}{5}$.

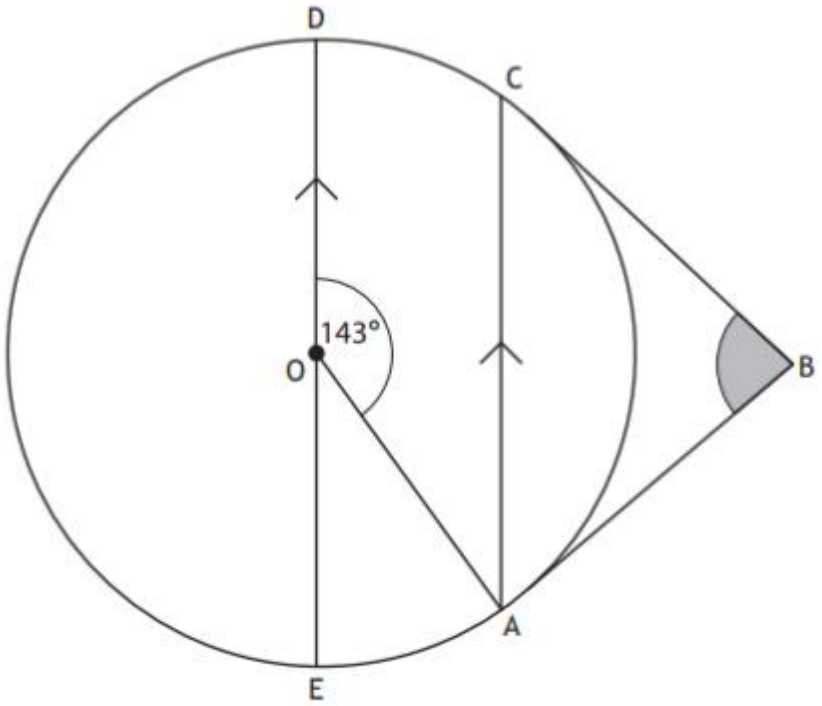
2. The diagram below shows the straight line joining points A and B.



Find the equation of the line AB.

Give the equation in its simplest form.

3. The diagram below shows a circle, centre O.



- AB and CB are tangents to the circle.
- AC and ED are parallel.
- Angle AOD is 143°.

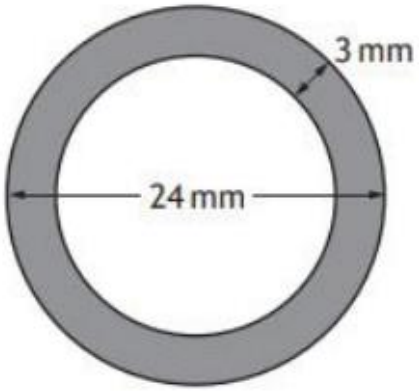
Calculate the size of angle ABC.

4. Factorise $4x^2 - 25$.

5. Expand and simplify $(2x+3)(x^2-4x+1)$.

6. A spherical sweet is made by coating a caramel sphere evenly with chocolate.

A cross-section of the sweet is shown below.



The diameter of the sweet is 24 millimetres and the thickness of the chocolate coating is 3 millimetres.

Calculate the volume of the chocolate coating.

Give your answer correct to 3 significant figures.

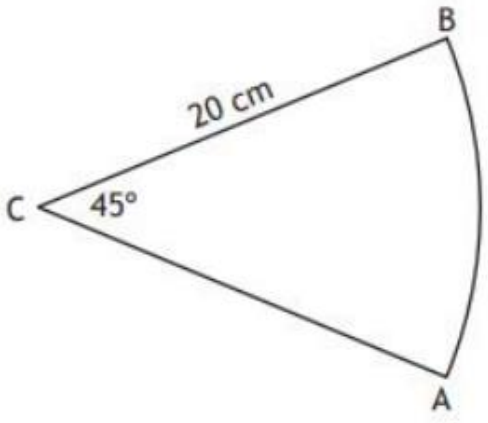
7. James paid £297·50 for a laptop in a sale.

The discount in the sale was 15%.

Calculate the original price of the laptop.

8. Factorise $6x^2 + 7x - 20$

9. The diagram shows a sector of a circle, centre C.



The radius of the circle is 20 centimetres and angle ACB is 45°.

Calculate the area of the sector.

Take $\pi = 3{\cdot}14$.

10. Express $x^2 + 8x - 7$ in the form $(x+a)^2 + b$.

11*. Brian and Bob visit a ski resort. Brian buys 3 full passes and 4 restricted passes. The total cost of his passes is £185.

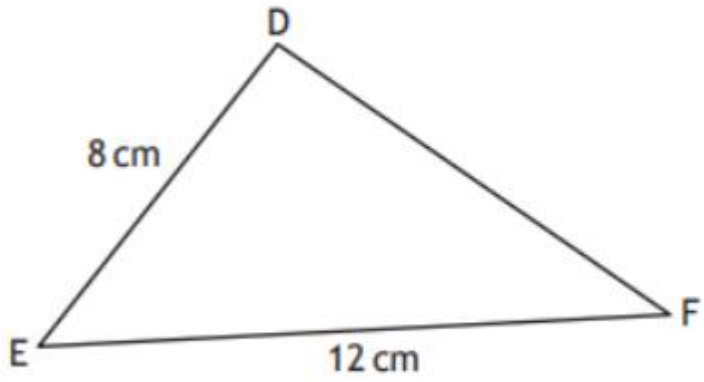
(a) Write down an equation to illustrate this information.

(b) Bob buys 2 full passes and 3 restricted passes.
The total cost of his passes is £130.
Write down an equation to illustrate this information.

(c) Find the cost of a restricted pass and the cost of a full pass.

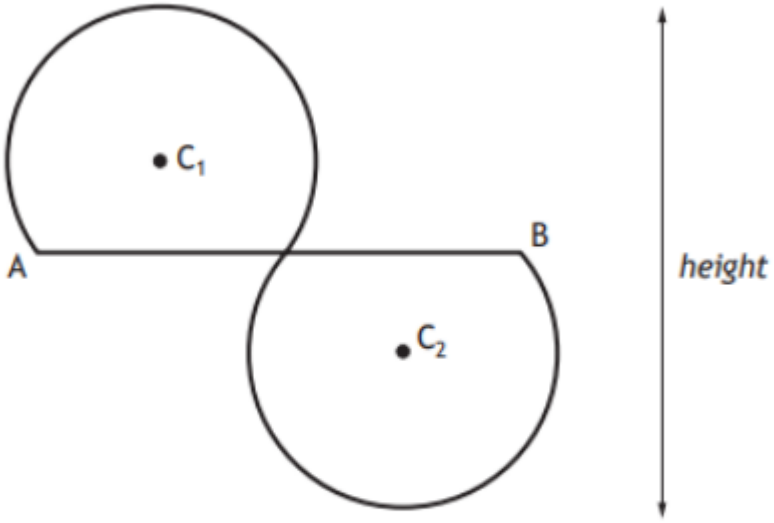
12*. In triangle DEF:

- DE = 8 centimetres
- EF = 12 centimetres
- $\sin E = \frac{2}{3}$



Calculate the area of triangle DEF.

13. Two identical shapes are used to form a logo.
Each shape is part of a circle.



- The circles have centres C_1 and C_2.
- The radius of each circle is 14 centimetres.
- The logo has half-turn symmetry about the mid-point of AB.
- AB is 48 centimetres long.

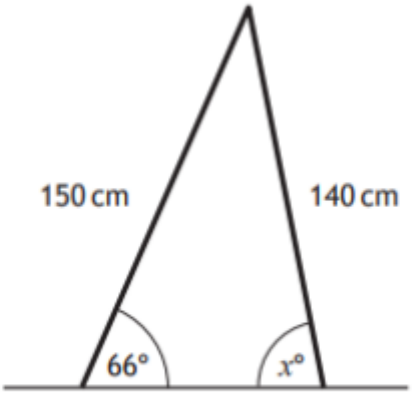
Calculate the height of the logo.

14. A straight line has equation $3x-5y-10=0$.

Find the gradient of this line.

15*. A set of stepladders has legs 150 centimetres and 140 centimetres long.

When the stepladder is fully open, the angle between the longer leg and the ground is 66°.



Calculate $x°$, the size of the angle between the shorter leg and the ground.

16*. Solve, algebraically, the system of equations

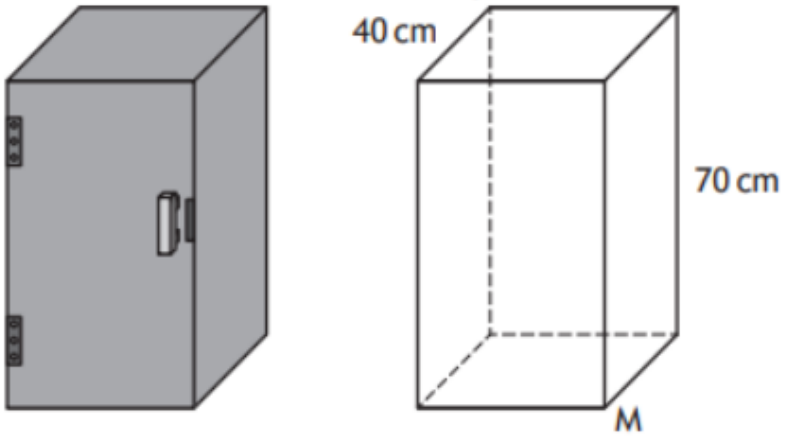
$$4x+5y=-3$$
$$6x-2y=5.$$

17. Evaluate $\frac{3}{4}\left(\frac{1}{3}+\frac{2}{7}\right)$.

Give your answer in its simplest form.

18. Chris wants to store his umbrella in a locker.

The locker is a cuboid with internal dimensions of length 40 centimetres, breadth 40 centimetres and height 70 centimetres.



The umbrella is 85 centimetres long.

He thinks it will fit into the locker from corner P to corner M.

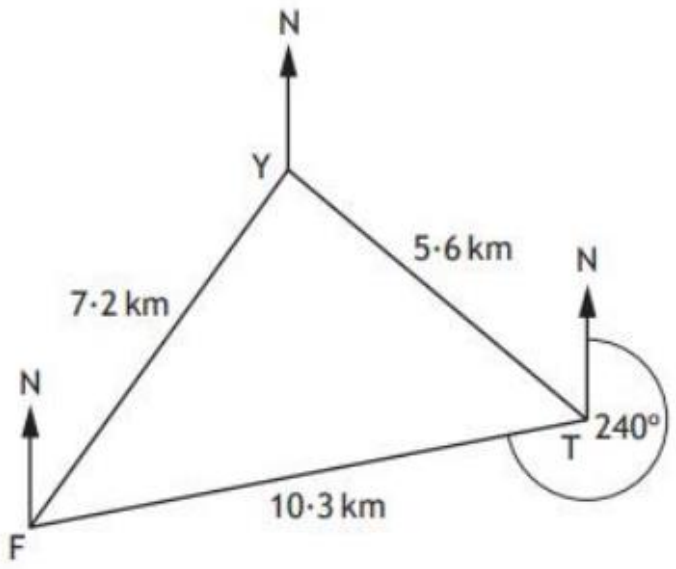
Is he correct?

Justify your answer.

19. Expand and simplify $(3x+1)(x-1)+2(x^2-5)$.

20*. A ferry and a trawler receive a request for help from a stranded yacht.

On the diagram the points F, T and Y show the positions of the ferry, the trawler and the yacht respectively.



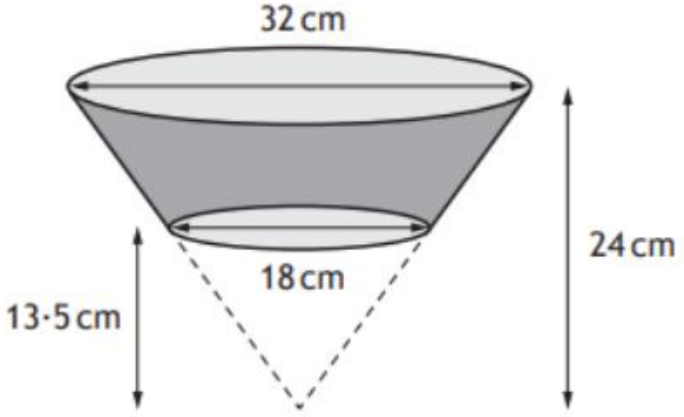
- FY is 7·2 kilometres.
- TY is 5·6 kilometres.
- FT is 10·3 kilometres.
- F is on a bearing of 240° from T.

Calculate the bearing of the yacht from the trawler.

21. A carton is in the shape of a large cone with a small cone removed.

The large cone has diameter of 32 cm and height 24 cm.

The small cone has diameter of 18 cm and height 13·5 cm.



Calculate the volume of the carton.

Give your answer correct to 2 significant figures.

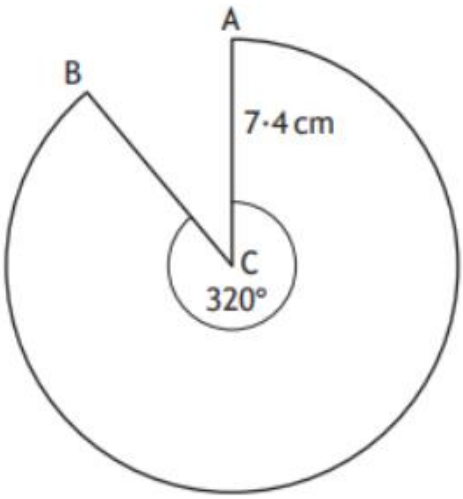
22. A house is valued at £240 000.
Its value is predicted to rise by 2·8% per annum.
Calculate its predicted value after 2 years.

23. Factorise fully $3x^2 - 48$.

24. **Screenwash is available in two different sized bottles, 'Mini' and 'Maxi'.**
The bottles are mathematically similar.

Calculate the volume of the 'Maxi' bottle.

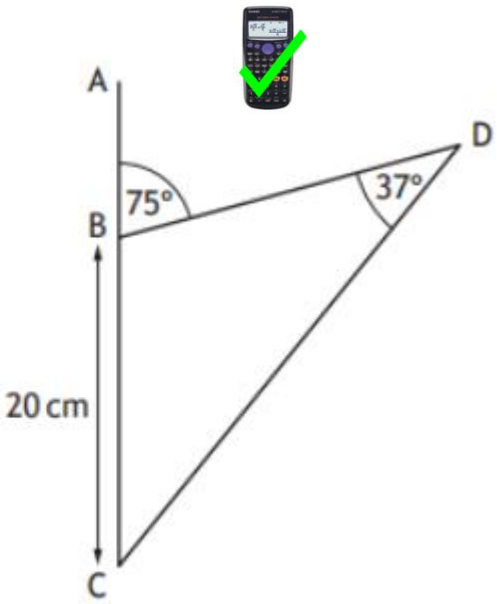
25. The diagram below shows a sector of a circle, centre C.



The radius of the circle is 7·4 centimetres.
Calculate the length of the major arc AB.

26*. In this diagram:

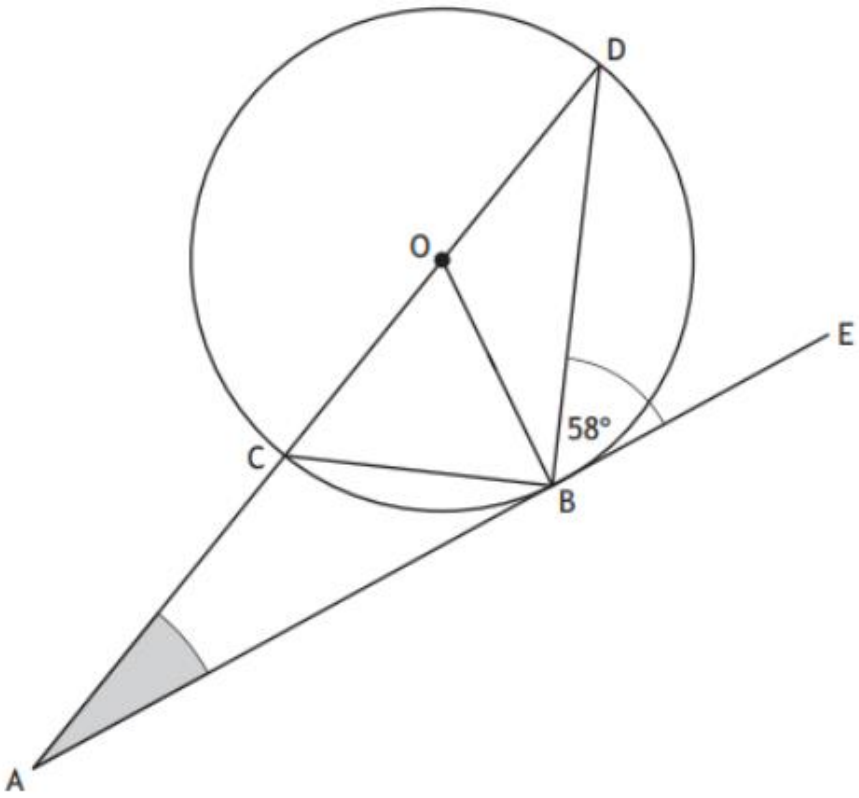
- angle ABD = 75°
- angle BDC = 37°
- BC = 20 centimetres.



Calculate the length of DC.

27. In the diagram shown below:

- ABE is a tangent to the circle centre O
- Angle DBE is 58°



Calculate the size of angle CAB.

Answers

1. $3\frac{2}{15}$ *or* $\frac{47}{15}$

2. $y = -2x + 4$

3. $Angle\ ABC = 74°$

4. $(2x - 5)(2x + 5)$

5. $2x^3 - 5x^2 - 10x + 3$

6. $volume = 4180\ mm^3$

7. £350

8. (3x – 4)(2x + 5)

9. Area = $157cm^2$

10. $(x + 4)^2 - 23$

11. $(a)\ 3f + 4r = 185$ $(b)\ 2f + 3r = 130$

    $(c)\ Restricted\ Pass = £20$ $Full\ pass = £35$

12*. $A = 32cm^2$

13. $height = 42.4\ cm$

14. $gradient = 0.6 \ or \ \frac{3}{5}$

15*. $x = 78°$

16*. $x = 0.5, \quad y = -1$

17. $\frac{13}{28}$

18. $Yes, \ since \ 85 < 90$

19. $5x^2 - 2x - 11$

20*. $Bearing = 282(.088)°$

21. $volume = 5300cm^3$

22. $Value = £253{,}628.16$

23. $3(x + 4)(x - 4)$

24. $Volume = 4.1472 \ litres$

25. $Length = 41.32 \ cm$

26*. $Length \ DC = 32.1 \ cm$

27. $CAB = 26°$