

Credit Mathematics - Practice Examination B

Please note ... the format of this practice examination is different from the current format. The paper timings are different and calculators can be used throughout.

MATHEMATICS **Standard Grade - Credit Level**

Time allowed - 2 hours 15 minutes

Read Carefully

1. Answer as many questions as you can.
2. Full credit will be given only where the solution contains appropriate working.
3. You may use a calculator

FORMULAE LIST

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

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

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

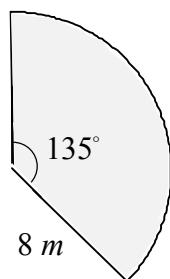
Area of a triangle: $\text{Area} = \frac{1}{2}ab \sin C$

KU	RA
3	
3	
	4
	4
2	
	3

1. Solve the following equation :

$$2x - 18 = 7x - 3$$

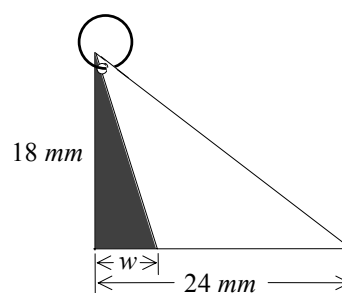
2.



A garden is in the shape of a sector of a circle. If the angle at the centre of the garden is 135° and the radius is 8 m , find the area of the garden to the nearest square metre.

3. A two-tone earring, in black and white, is in the shape of a right-angled triangle. Its dimensions are shown in the diagram opposite.

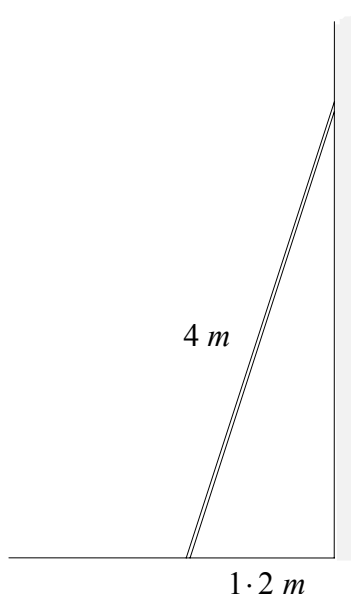
If the black area is exactly $\frac{1}{4}$ of the full triangular area, find the length w .



4. A hospital patient is given 200 mg of a blood-thinning drug at 1.00 pm. 12% of the amount of the drug at the **beginning** of any hour is lost to his blood stream by the **end** of that hour (due to natural body processes).

For the drug to be successful, there must be at least 125 mg of it in his blood stream. Between which two hours in the day will the amount of the drug drop below 125 mg ? **SHOW YOUR WORKING CLEARLY.**

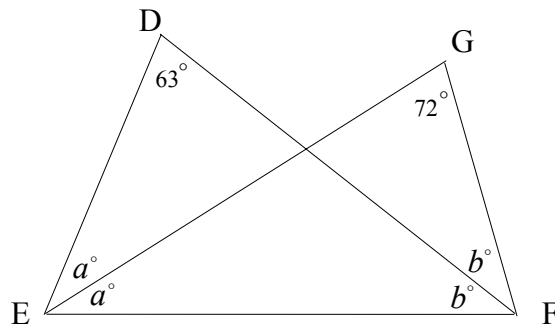
5.



A window cleaner is washing the windows in a block of flats.

- (a) If his 4 metre long ladder is placed 1.2 metres from the base of the wall, how far up the building will it reach?
- (b) The cleaner wishes the ladder to rest on a window sill which is 6 metres above the ground. He can extend his ladder by 2.1 metres . If he places the ladder at the same point on the ground as before, with the 2.1 metre extension in place, will it reach the window sill? **JUSTIFY YOUR ANSWER.**

6.



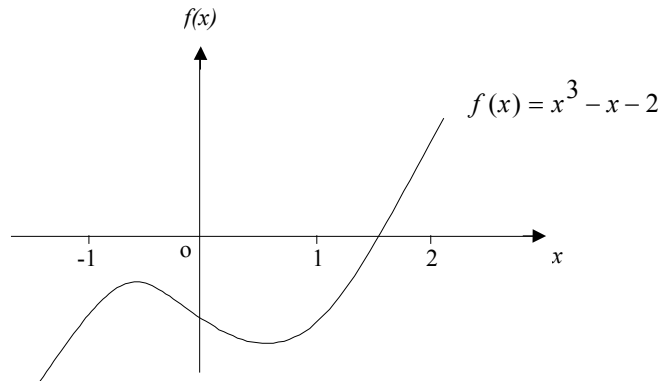
In the diagram above, which is not drawn to scale, the line DF bisects the angle GFE and the line GE bisects the angle DEF .

- In the triangle DEF , show that $2a + b = 117$.
- Use triangle GFE to form another equation connecting a and b and hence, or otherwise, find the values of a and b .

2

5

7. Below is part of the graph of $f(x) = x^3 - x - 2$.



It has a root between $x = 1$ and $x = 2$.
Use iteration to find this root, correct to 1 decimal place.
SHOW ALL YOUR WORKING CLEARLY.

3

8. (a) Factorise $2p^2 - 9p + 4$.

2

(b) Express $\frac{3}{x-1} - \frac{2}{x}$ as a single fraction in its simplest form.

3

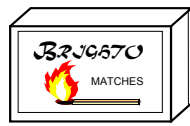
(c) The planet Pluto is about 5.91×10^9 km from the sun.
Light travels from the sun at a speed of 3×10^5 km per second.
How many hours does it take for the sun's light to reach Pluto?

3

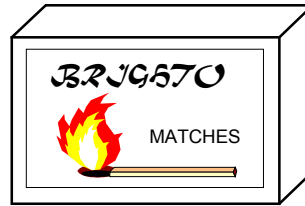
9. Show that, if $x = yz$ and $y = \frac{z}{x^2}$, then $x = \frac{1}{y^2}$.

4

10.



5.4 cm



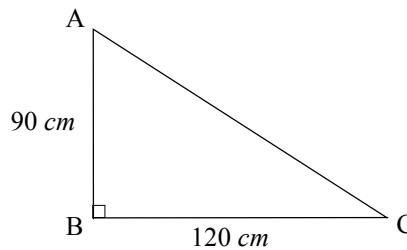
13.5 cm

The ordinary match box and the giant “picnic” size match box, shown above, are mathematically similar. If the volume of the smaller box is 15.2 cm^3 calculate the volume of the larger box.

4

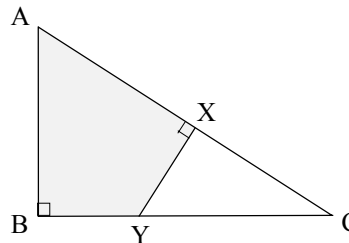
11. While rummaging in his attic a man finds a triangular sheet of stiff cardboard. The sheet has dimensions as shown in *diagram 1*.

diagram 1



He decides to make a kite for his son out of the cardboard by making a cut at right angles somewhere along the line AC as shown in *diagram 2*.

diagram 2

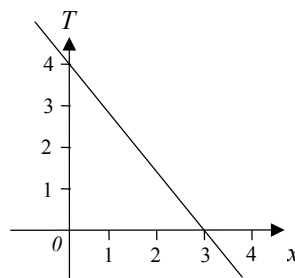


- Write down the length of AX.
- By considering two similar triangles, or otherwise, show that the exact length of the cut XY is 45 cm .

1

5

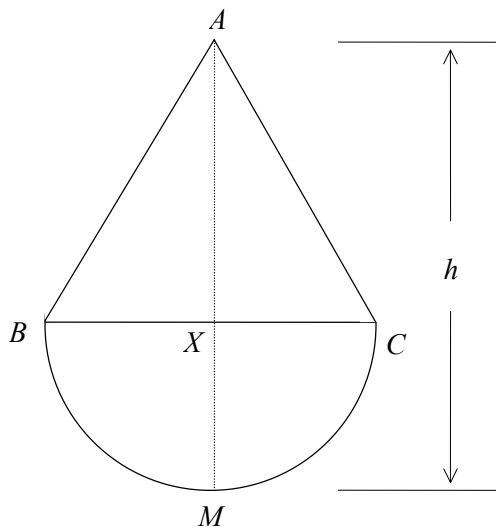
12. Find the equation of the straight line shown opposite in terms of T and x .



4

KU	RA
	4
	1
	3
	4
	2
	5

13.

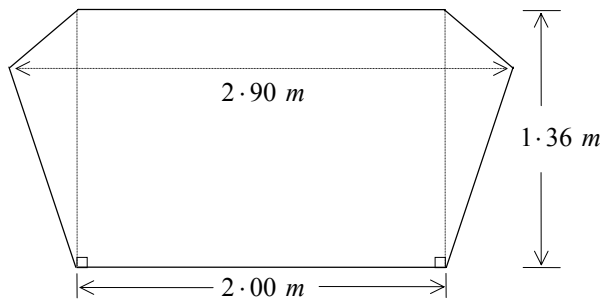


The outline of a buoy consists of an equilateral triangle of side 120 cm with a semi-circular base as shown opposite. AM is an axis of symmetry.

- State the radius of the base and show that the vertical height, h , is equal to 164 cm when rounded to the nearest whole number.
- Taking s as the length of AC , write down expressions for the lengths of XC and XM in terms of s .
- Hence or otherwise show that $h = 1.37s$.

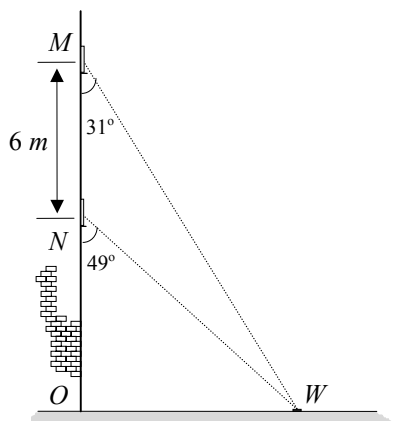
14.

A skip is a metallic container, used for the collection and eventual disposal of rubbish from building sites, factories, etc. The cross-section of one such skip is shown below. The cross-section is symmetrical.



- Find the area of this cross-section.
- If the skip is 2.15 metres in depth, calculate the volume of the skip, giving your answer correct to the nearest whole number of cubic metres.

15.



From a window at M in a building, a man spots a wallet lying at W in the carpark. The same wallet is spotted by his colleague from the window at N which is 6 metres below window M . If the angles between the building and their lines of sight are 31° and 49° respectively, find the distance from the wallet to the base of the wall.

5

Credit Mathematics - Practice Exam B

Marking Scheme

1. For $-5x = 15$ (2)
 For $x = -3$ (1) **[3 marks KU]**
-

2. For using $\frac{135}{360}$ (1)
 For correct subst. (1)
 For answer $A = 75 \cdot 36 \text{m}^2$ (1)
 (Accept all correct roundings) **[3 marks KU]**
-

3. For A (large) $\Delta = 216 \text{ mm}^2$ (1)
 For $\frac{1}{4} A$ (large) $\Delta = 54 \text{ mm}^2$ (1)
 For $\frac{1}{2} \times w \times 18 = 54$ (1)
 For $w = 6 \text{ mm}$ (1) *[4 marks RA]*
-

4. For 12% of 200mg = 24mg (or 0.88 as a multiplier) (1)
 For Compound use of 12% (1)
 For < 125 by the end of 4 hours (between 3 and 4) (1)
 For answer between 4 pm and 5 pm (1) **[4 marks KU]**
-

5. (a) For $4^2 = 1 \cdot 2^2 + d^2$ (1)
 For $d = 3.8 \text{ m}$ (1) **[2 marks KU]**
- (b) For $6 \cdot 1^2 = 1 \cdot 2^2 + d^2$ (1)
 For $d = 5.98 \text{ m}$ (1)
 For consistent conclusion (1) *[3 marks RA]*
-

6. a) For $2a + 63 + b = 180$ (or equiv) (1)
 For $2a + b = 117$ (1) *[2 marks RA]*
- b) For $2b + a + 72 = 180$ (1)
 For $2b + a = 108$ (1)
 For knowing to use Sim Eqns (1)
 For $a = 42$ (1)
 For $b = 33$ (1) *[5 marks RA]*
-

7. For methodical approach (1)
 For $f(1.5) < \text{root} < f(1.6)$ (1)
 For $\text{root} = 1.5$ to 1 d.p. (1) **[3 marks KU]**

8. (a) For each factor ... (1 mark)
 i.e. $(2p - 1)(p - 4)$ (2) [2 marks KU]
- (b) For correct denom. i.e. $x(x - 1)$ (1)
 For correct num. i.e. $3x - 2(x - 1)$ (1)
 For answer $\frac{x + 2}{x(x - 1)}$ (1) [3 marks KU]
(Expansion of brackets is O.K. but 1 off for further cancelling)
- (c) For $(5 \cdot 91 \times 10^9) \div (3 \times 10^5)$, stated or implied (1)
 For $1 \cdot 97 \times 10^4$ or 19700 seconds (1)
 For answer = 5.5 hours (1) [3 marks KU]

9. For eliminating z e.g. $yx^2 = z$ (1)
 For $x = y(yx^2)$ (1)
 For $1 = y^2x$ (1)
 For $\frac{1}{y^2} = x$ (1) [4 marks RA]

10. For S.F. = 2.5 (1)
 For Vol SF = $2 \cdot 5^3 = 15 \cdot 625$ (1)
 For $V = 15 \cdot 625 \times 15 \cdot 2$ (1)
 For $V = 237 \cdot 5 \text{ cm}^3$ (1) [4 marks KU]

11. (a) For $AX = 90 \text{ cm}$ (1) [1 mark RA]
- (b) There are a number of solutions. However, almost all will depend on finding $AC = 150$
 For $AC = 150$ (by Pyth.) (1)
- Possible Solution** (Similar Δ 's)
 For use of similar triangles (stated/implied) (1)
 For $\frac{XY}{90} = \frac{60}{120}$ (2)
 For ans. $x = 45 \text{ cm}$ (1) [5 marks RA]

N.B. Last mark unavailable if previous error has occurred.

For solutions involving the use of trig functions which lead to an approximate, but inexact, value of $XY = 45\text{cm}$, give $\frac{3}{5}$ for part (b)

12. For $m = \frac{4 - 0}{0 - 3}$ (stated or implied) (1)
 For $m = -\frac{4}{3}$ (accept -1.33 but not 1.3) (1)
 For $C = 4$ (1)
 For $T = -\frac{4}{3}x + 4$ (accept $y = \dots$) (1) [4 marks KU]

13. (a) For $r = 60$ cm (1)
 For $AX = 104$ cm (2)
 For $h = 164$ cm (1) [4 marks RA]
- (b) For $XC = XM = \frac{1}{2}s$ (1) [1 mark RA]
- (c) For $AX^2 = s^2 - (\frac{1}{2}s)^2$ (1)
 For $AX = 0.87s$ (or equivalent) (1)
 For $h = 1.37s$ (1) [3 marks RA]
-

14. (a) For Area (side Δ) = $\frac{1}{2} \times 1.36 \times 0.45 = 0.306 m^2$ (1)
 For $2 \times$ area of triangle = $0.612 m^2$ (1)
 For area of rectangle = $2.72 m^2$ (1)
 For total area = $3.332 m^2$ (accept approx.) (1) [4 marks KU]
- (b) For $V =$ area \times length (stated or implied) = 3.332×2.15 (1)
 = $7.1638 m^3$ (or a rounded off figure) (1) [2 marks KU]
-

15. For $\angle MNW = 131^\circ$ and $\angle MWN = 18^\circ$ (stated or implied) (1)
 For $\frac{6}{\sin 18} = \frac{NW}{\sin 31}$ (or $\frac{MW}{\sin 131}$) (1)
 For $NW = 10.0$ (or $MW = 14.7$) (1)
 For $OW = 10 \times \cos 41^\circ$ (or $14.7 \times \cos 59^\circ$) (1)
 For $OW = 7.5 m$ (1)

N.B. Do not penalize approximations which, when carried through, may lead to - e.g. $OW = 7.6 m$

[5 marks RA]

16. For $VT^2 = 700^2 + 1050^2 - (2 \times 700 \times 1050 \cos 120^\circ)$ (1)
 For = - (735000) (1)
 For = 2327500 (1)
 For $VT = 1525.6 m$ (or reasonable approximation) (1) [4 marks KU]
-

17. For $\cos x = -\frac{2}{3}$ (1)
 For $x = 131.8^\circ$ (1)
 For $x = 228.2^\circ$ (1) [3 marks KU]
-

- 18 (a) For $1^2 + 3^2 + 5^2 + 7^2 + 9^2 + 11^2 + 13^2 = \frac{7 \times 13 \times 15}{3}$ (2)
- (b) $S = \frac{n \times (2n-1) \times (2n+1)}{3}$ (3) [5 marks RA]

N.B. Do not penalise bad form - e.g. $2n - 1 + 2$ for $2n + 1$, only 1 mark off for lack of brackets.

Totals	KU 44	RA 42
--------	----------	----------