A screenshot of a cell phone

Description automatically generated

**Indices**

**Instructions**

* Use **black** ink or ball-point pen.
  + **Fill in the boxes** at the top of this page with your name,  
    centre number and candidate number.
* Answer **all** questions.
* Answer the questions in the spaces provided  
  *– there may be more space than you need.*
* You must **show all your working.**
* Diagrams are **NOT** accurately drawn, unless otherwise indicated.
* If your calculator does not have a *π* button, take the value of *π* to be3.142

unless the question instructs otherwise.

**Information**

* The total mark for this paper is **51**. There are **27** questions.
* Questions have been arranged in an ascending order of mean difficulty, as found by all students in the June 2017–November 2019 examinations.
* The marks for **each** question are shown in brackets  
  *– use this as a guide as to how much time to spend on each question.*

**Advice**

1. Read each question carefully before you start to answer it.
2. Keep an eye on the time.
3. Try to answer every question.
4. Check your answers if you have time at the end.

**1** Find the value of 65

.......................................................

**(Total for Question 1 is 1 mark)**

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**2** (*b*)Work out 23

......................................................

**(Total for Question 2 is 1 mark)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**3** Work out the value of 24

.......................................................

**(Total for Question 3 is 1 mark)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**4** Work out the value of 35

......................................................

(**Total for Question 4 is 1 mark**)

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**5** Find the value of 54

.......................................................

**(Total for Question 5 is 1 mark)**

**6** Simplify 3 × 4*t*

.......................................................

(**Total for Question 6 is 1 mark**)

**7** (*a*)Simplify 3 *f* × 5 *g*

......................................................

**(1)**

(*b*)Simplify *t* × *t*

......................................................

**(1)**

**(Total for Question 7 is 2 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**8** Simplify *d* 2 × *d* 3

.......................................................

**(Total for Question 8 is 1 mark)**

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**9** (*a*)Simplify *a* × *b* × 7

.......................................................

**(1)**

(*b*)Simplify *y* × *y* × *y*

.......................................................

**(1)**

(*c*)Simplify fully 

.......................................................

**(2)**

**(Total for Question 9 is 4 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**10** (*a*)Simplify 5*f* – *f* + 2*f*

.......................................................

**(1)**

(*b*)Simplify 2 × *m* × *n* × 8

.......................................................

**(1)**

(*c*)Simplify *t*2 + *t*2

.......................................................

**(1)**

**(Total for Question 10 is 3 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**11** (a)Simplify *y*3 + *y*3

.......................................................

**(1)**

(b)Factorise *m*2 + *m*

.......................................................

**(1)**

**(Total for Question 11 is 4 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**12** The same number is missing from each box.

× × = 343

(*a*) Find the missing number.

.......................................................

**(1)**

(*b*) Work out 44.

.......................................................

**(1)**

**(Total for Question 12 is 2 marks)**

**13** (*a*)Write down the value of 

.......................................................

**(1)**

(*b*)Work out the value of 53

.......................................................

**(1)**

(**Total for Question 13 is 2 marks**)

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**14** *p*3 × *px* = *p*9

(*a*)Find the value of *x*.

*x* = .....................................................

**(1)**

(72)*y* = 710

(*b*)Find the value of *y*.

*y* = .....................................................

**(1)**

100*a* × 1000*b* can be written in the form 10*w*

(*c*)Show that *w* = 2*a* + 3*b*

**(2)**

**(Total for Question 14 is 4 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**15** *p*2 × *pn* = *p*6

Find the value of *n*.

.......................................................

**(Total for Question 15 is 1 mark)**

**16** (*a*)Simplify (*p*2)5

.......................................................

**(1)**

(*b*)Simplify 12*x*7*y*3 ÷ 6*x*3*y*

.......................................................

**(2)**

**(Total for Question 16 is 3 marks)**

**17** (*c*)Simplify (*m*3)2

.........................................

**(Total for Question 17 is 1 mark)**

**18** Work out (–3)3

.........................................

**(Total for Question 18 is 1 mark)**

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**19** Work out (−2)3

..........................................

**(1)**

**(Total for Question 19 is 3 marks)**

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**20** (*a*) Simplify (*t*3)2

.......................................................

**(1)**

(*b*) Simplify 

.......................................................

**(1)**

**(Total for Question 20 is 2 marks)**

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**21** Simplify 3*y*2 × 4*y*3

.......................................................

**(Total for Question 21 is 1 mark)**

**22** Simplify 3*p*2*r*4 × 5*p*4*r*

.......................................................

**(2)**

**(Total for Question 22 is 2 marks)**

**23** Simplify 5*u*2*w*4 × 7*uw*3

.......................................................

**(2)**

**(Total for Question 23 is 2 marks)**

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**24** Work out the value of 

......................................................

**(Total for Question 24 is 2 marks)**

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**25** (*a*) Write  as a power of 3.

.......................................................

**(2)**

(*b*) Write down the value of 120

.......................................................

**(1)**

(*c*)Write down the value of 3–2

.......................................................

**(1)**

**(Total for Question 25 is 4 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**26** (*a*)Simplify *m*3 × *m*4

......................................................

(**1**)

(*b*)Simplify (5*np*3)3

......................................................

(**2**)

(*c*)Simplify 

......................................................

(**2**)

(**Total for Question 26 is 5 marks**)

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**27** Write down the value of 2–3

.......................................................

**(1)**

**(Total for Question 27 is 1 mark)**

**TOTAL MARKS FOR PAPER: 51**