



University of Bolton  
Off Campus Division, Western International College  
BEng (Hons) Mechanical Engineering  
Semester 1 Examination 2022/2023  
Graphical Communication & Computer Modelling  
Module No: AME 4065

1. Write the full form of the following Standard Drawing abbreviation seen on engineering drawings:

- CBORE .....
- MATL .....
- SPEC .....

(3 marks)

2. Write the standard abbreviation for the following when required on an engineering drawing:

- SCREW .....
- PITCH CIRCLE DIAMETER .....
- CHAMFER .....

(3 marks)

3. Using the partially completed figures below, sketch the standard representation for the following features which might appear on an engineering drawing:

**Straight Knurl:**



Figure 3 (a)

(3 marks)

**Round head:**

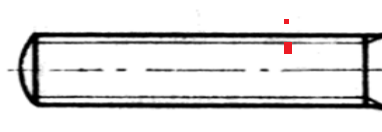


Figure 3 (b)

(3 marks)

**A counterbore through hole (Tick the right answer)**

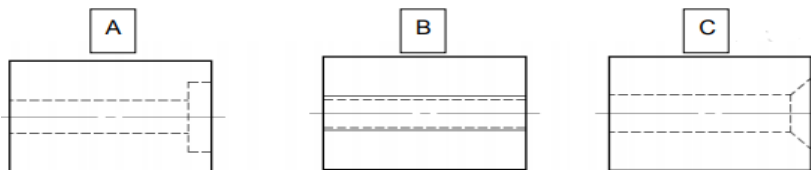


Figure 3(c)

(3 marks)

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4. Drawn below in **figure 4** is a cross-section through a Shaft, Bush Bearing and Housing arrangement. Select fits that allow and fill the data in **Table Q4** below.
- i) The bush must remain in the Housing.
  - ii) The shaft must easily slide and rotate in the bush.

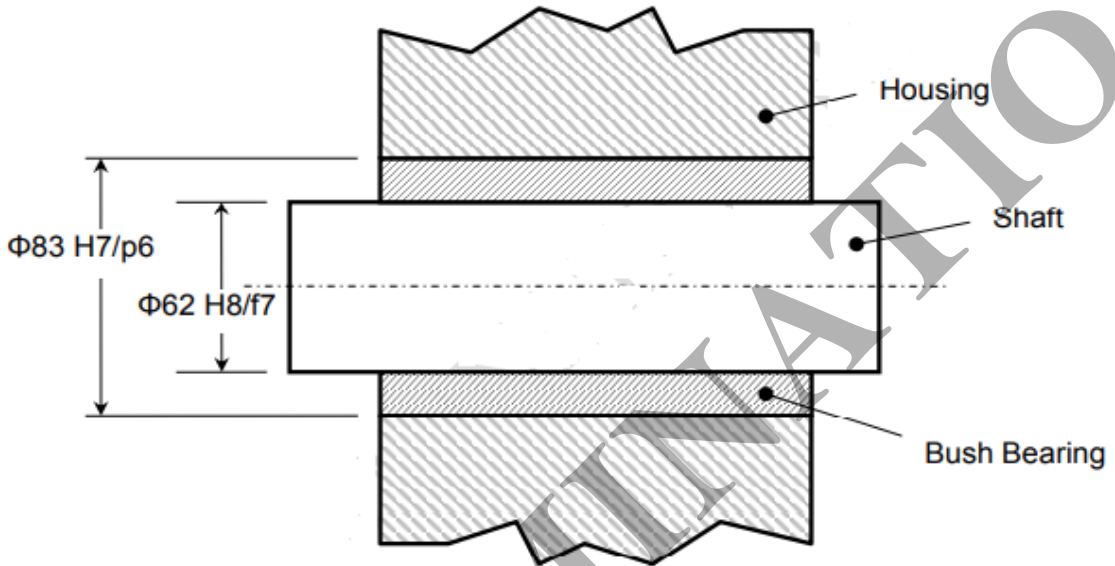


Figure 4

Using BS EN 20286-2 Tolerance Tables (supplied), complete the following table:

**Table Q4: Fits and Tolerance table.**

Between Components	Grade of Tolerance	Type of Fit	Limits of Size for:	Size of Tolerance
Bush/Shaft	H8f7		Bush	
			Shaft	
Housing/Bush	H7 p6		Housing	
			Bush	

(12 marks)

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5. State name and describe the meaning of the following Geometrical Tolerance symbols:

a. //  
.....  
.....

b. ○  
.....  
.....

c.  $\perp$   
.....  
.....

(3 marks each) - 9 Marks

6. Describe the geometric tolerances for the figure 6 below.

- I. What the symbols and dimensional information mean.
- II. The significance of the frame in the context of this component.

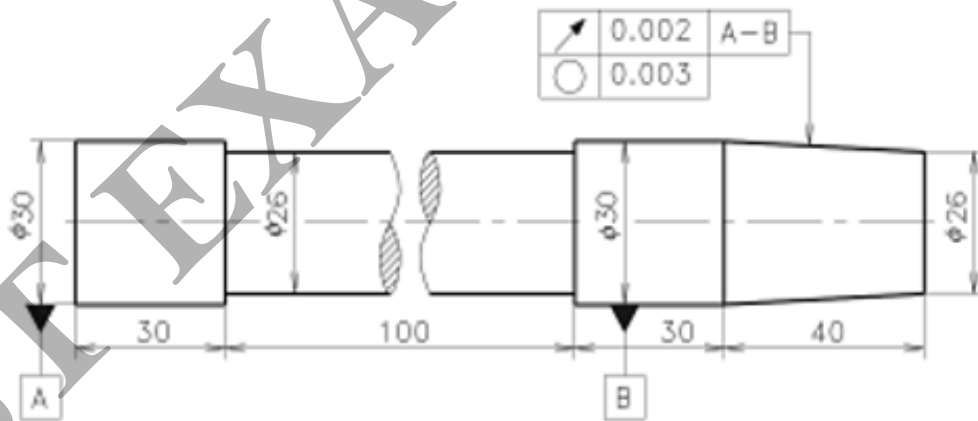


Figure 6: Spindle of a grinder.

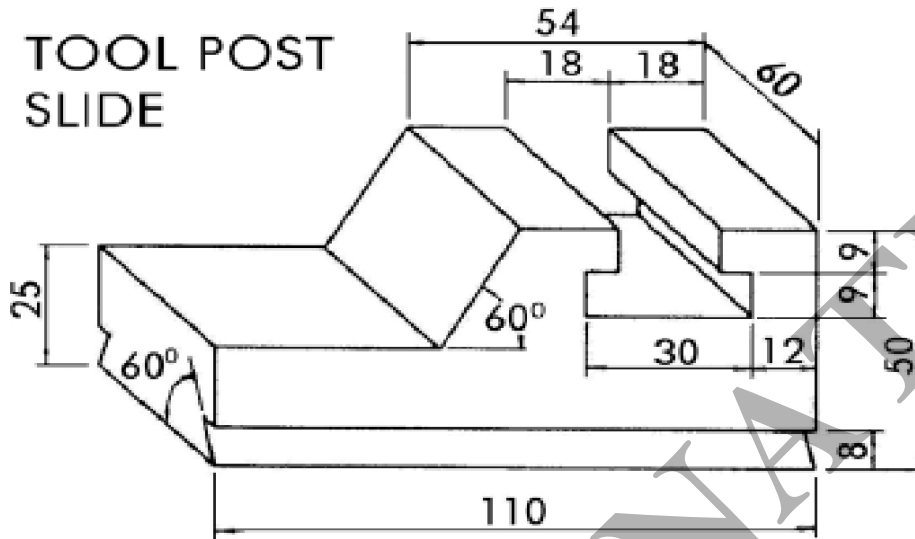
.....  
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.....  
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.....

(8 Marks)

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7. An isometric drawing of a tool post is given below in **Figure 7**. The drawing is not to the scale. Use front view (F.V.) shown below with an arrow for drawing reference.



**Figure 7: Tool Post.**

Sketch in 1<sup>st</sup> Angle Projection, the Elevation and Plan view of the given drawing in **SHEET Q7** with proper projection symbol and student number in title block.

a) Elevation View

(8 marks)

b) Plan View

(4 marks)

c) Student number: 1 mark and Projection symbol: 1 mark)

(2 marks)

**Total 14 marks**

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8. **SHEET Q8** shows a partially completed Orthographic drawing section of a Lever. The Plan View is already drawn and the Section View is missing. The cutting plane passes longitudinally through the centre of the web and section plane is given in the Top view of the lever as A-A.

The overall dimensions shown are in mm with a section line as A-A. Supply all sectioning information as necessary. Put your student number in the title block.

Sketch using 3<sup>rd</sup> Angle method of projection the following

- a) Dimensioned Front View (6 marks)
- b) Sectioning with the section line A-A (4 marks)
- c) Student number and Projection symbol (2 marks)

**Total 12 marks**

9. Shown below is the 'Universal Coupling Parts' drawing on page 7, the components that make up a Universal Coupling Assembly. Each part is dimensioned appropriately with two views for reference. (The drawing is in mm):

Use a pencil and setsquares; draw an **assembly drawing** in **SHEET Q9**. Show all the parts assembled in their correct positions and hatched according to drawing conventions.

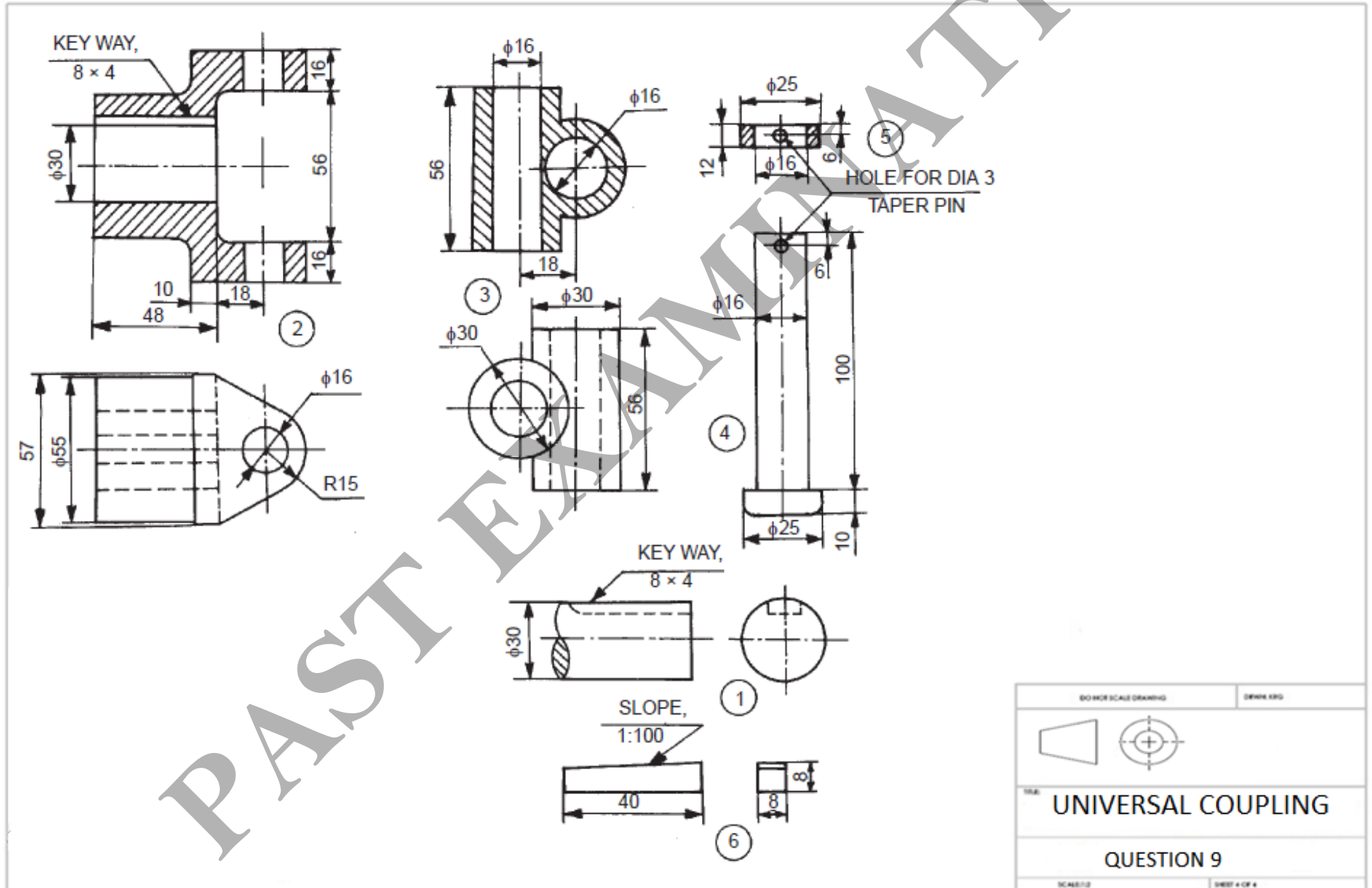
- a) Complete Front View in good proportion (10 marks)
- b) Sectioning of the assembly drawing (4 marks)
- c) Balloon reference the assembly (2 marks),
- d) Create Part list of the assembly (4 marks)

**Total: 20 Marks**

**PLEASE TURN THE PAGE FOR SUPPLEMENTARY SHEETS AND TOLERANCE TABLES**

-----END OF QUESTIONS -----

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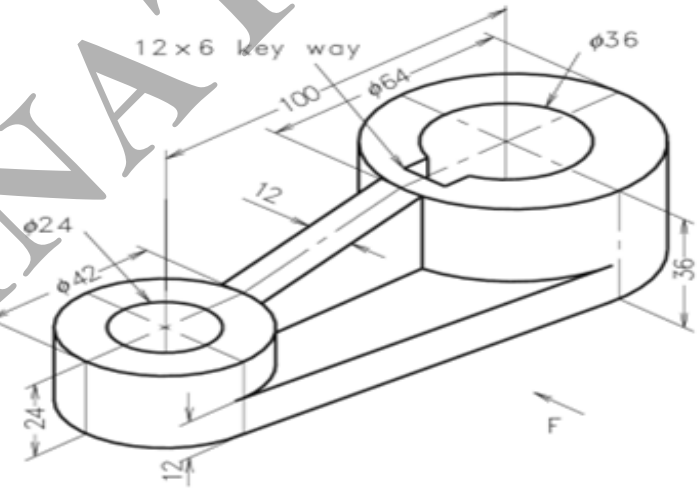
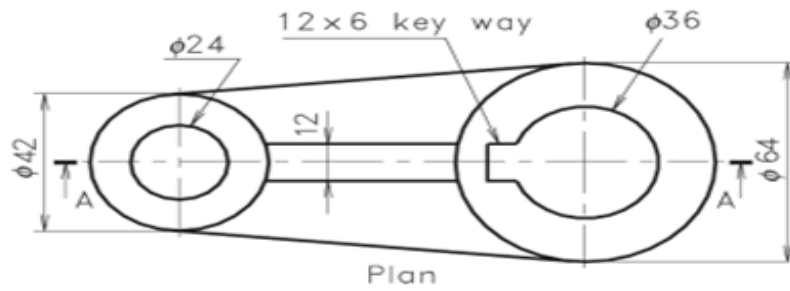
**SHEET Q7**

PROJECTION	STU NO.
	TITLE: QUESTION 7
	<small>SHEET 8 OF 8</small>



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**SHEET Q8**




PROJECTION	STU NO.
	TITLE: QUESTION 8
	SHEET 1 OF 1

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**SHEET Q9**

PAST EXAMINATION

DO NOT SCALE DRAWING		DEFINER: ERS
	STUDENT NO:	
TITLE: UNIVERSAL COUPLING		
QUESTION 9 ANSWER SHEET		
SCALE: 1:1	SHEET # OF 4	



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<b>JS7</b>	+6 -6	+7.5 -7.5	+9 -9	+10.5 -10.5	+12.5 -12.5	+15 -15	+17.5 -17.5	+20 -20	+23 -23	+26 -26	+28.5 -28.5								
<b>JS8</b>	+9 -9	+11 -11	+13.5 -13.5	+16.5 -16.5	+19.5 -19.5	+23 -23	+27 -27	+31.5 -31.5	+36 -36	+40.5 -40.5	+44.5 -44.5								
<b>K6</b>	+2 -6	+2 -7	+2 -9	+2 -11	+3 -13	+4 -15	+4 -18	+4 -21	+5 -24	+5 -27	+7 -29								
<b>K7</b>	+3 -9	+5 -10	+6 -12	+6 -15	+7 -18	+9 -21	+10 -25	+12 -28	+13 -33	+16 -36	+17 -40								
<b>K8</b>	+5 -13	+6 -16	+8 -19	+10 -23	+12 -27	+14 -32	+16 -38	+20 -43	+22 -50	+25 -56	+28 -61								
<b>M6</b>	-1 -9	-3 -12	-4 -15	-4 -17	-4 -20	-5 -24	-6 -28	-8 -33	-8 -37	-9 -41	-10 -46								
<b>M7</b>	0 -12	0 -15	0 -18	0 -21	0 -25	0 -30	0 -35	0 -40	0 -46	0 -52	0 -57								
<b>M8</b>	+2 -16	+1 -21	+2 -25	+4 -29	+5 -34	+5 -41	+6 -48	+8 -55	+9 -63	+9 -72	+11 -78								
<b>N6</b>	-5 -13	-7 -16	-9 -20	-11 -24	-12 -28	-14 -33	-16 -38	-20 -45	-22 -51	-25 -57	-26 -62								
<b>N7</b>	-4 -16	-4 -19	-5 -23	-7 -28	-8 -33	-9 -39	-10 -45	-12 -52	-14 -60	-14 -66	-16 -73								
<b>N8</b>	-2 -20	-3 -25	-3 -30	-3 -36	-3 -42	-4 -50	-4 -58	-4 -67	-5 -77	-5 -86	-5 -94								
<b>P6</b>	-9 -17	-12 -21	-15 -26	-18 -31	-21 -37	-26 -45	-30 -52	-36 -61	-41 -70	-47 -79	-51 -87								
<b>P7</b>	-8 -20	-9 -24	-11 -29	-14 -35	-17 -42	-21 -51	-24 -59	-28 -68	-33 -79	-36 -88	-41 -98								
<b>P8</b>	-12 -30	-15 -37	-18 -45	-22 -55	-26 -65	-32 -78	-37 -91	-43 -106	-50 -122	-56 -137	-62 -151								
<b>R6</b>	-12 -20	-16 -25	-20 -31	-24 -37	-29 -45	-35 -54	-37 -56	-44 -66	-47 -69	-56 -81	-58 -83	-61 -86	-68 -97	-71 -100	-75 -104	-85 -117	-89 -121	-97 -133	-103 -139
<b>R7</b>	-11 -23	-13 -28	-16 -34	-20 -41	-25 -50	-30 -60	-32 -62	-38 -73	-41 -76	-48 -88	-50 -90	-53 -93	-60 -106	-63 -109	-67 -113	-74 -126	-78 -130	-87 -144	-93 -150

### ISO Tolerances for Shafts (ISO 286-2)

#### Nominal Shaft Sizes (mm)

over	3	6	10	18	30	40	50	65	80	100	120	140	160	180	200	225	250	280	315	355
inc.	6	10	18	30	40	50	65	80	100	120	140	160	180	200	225	250	280	315	355	400
<b>micrometres</b>																				
<b>a12</b>	-270 -390	-280 -430	-290 -470	-300 -510	-	-	-	-	-	-	-	-	-	-660 -1120	-740 -1200	-820 -1280	-920 -1440	-	-	-
					310 560	320 570	340 640	360 660	380 730	410 760	460 860	520 920	580 980					1050 1570	1200 1770	1350 1920
<b>d6</b>	-30 -38	-40 -49	-50 -61	-65 -78	-80 -96	-100 -119	-120 -142					-145 -170			-170 -199			-190 -222		
<b>e6</b>	-20 -28	-25 -34	-32 -43	-40 -53	-50 -66	-60 -79	-72 -94					-85 -110			-100 -129			-110 -142		
<b>e13</b>	-20 -200	-25 -245	-32 -302	-40 -370	-50 -440	-60 -520	-72 -612					-85 -715			-100 -820			-110 -920		
<b>f5</b>	-10 -15	-13 -19	-16 -24	-20 -29	-25 -36	-30 -43	-36 -51					-43 -61			-50 -70			-56 -79		

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<b>f6</b>	-10 -18	-13 -22	-16 -27	-20 -33	-25 -41	-30 -49	-36 -58	-43 -68	-50 -79	-56 -88	-62 -98
<b>f7</b>	-10 -22	-13 -28	-16 -34	-20 -41	-25 -50	-30 -60	-36 -71	-43 -83	-50 -96	-56 -108	-62 -119
<b>g5</b>	-4 -9	-5 -11	-6 -14	-7 -16	-9 -20	-10 -23	-12 -27	-14 -32	-15 -35	-17 -40	-18 -43
<b>g6</b>	-4 -12	-5 -14	-6 -17	-7 -20	-9 -25	-10 -29	-12 -34	-14 -39	-15 -44	-17 -49	-18 -54
<b>g7</b>	-4 -16	-5 -20	-6 -24	-7 -28	-9 -34	-10 -40	-12 -47	-14 -54	-15 -61	-17 -69	-18 -75
<b>h4</b>	-0 -4	-0 -4	-0 -5	-0 -6	-0 -7	-0 -8	-0 -10	-0 -12	-0 -14	-0 -16	-0 -18
<b>h5</b>	-0 -5	-0 -6	-0 -8	-0 -9	-0 -11	-0 -13	-0 -15	-0 -18	-0 -20	-0 -23	-0 -25
<b>h6</b>	-0 -8	-0 -9	-0 -11	-0 -13	-0 -16	-0 -19	-0 -22	-0 -25	-0 -29	-0 -32	-0 -36
<b>h7</b>	-0 -12	-0 -15	-0 -18	-0 -21	-0 -25	-0 -30	-0 -35	-0 -40	-0 -46	-0 -52	-0 -57
<b>h8</b>	-0 -18	-0 -22	-0 -27	-0 -33	-0 -39	-0 -46	-0 -54	-0 -63	-0 -72	-0 -81	-0 -89
<b>h9</b>	-0 -30	-0 -36	-0 -43	-0 -52	-0 -62	-0 -74	-0 -87	-0 -100	-0 -115	-0 -130	-0 -140
<b>h10</b>	-0 -48	-0 -58	-0 -70	-0 -84	-0 -100	-0 -120	-0 -140	-0 -160	-0 -185	-0 -210	-0 -230
<b>h11</b>	-0 -75	-0 -90	-0 -110	-0 -130	-0 -160	-0 -190	-0 -220	-0 -250	-0 -290	-0 -320	-0 -360
<b>h12</b>	-0 -120	-0 -150	-0 -180	-0 -210	-0 -250	-0 -300	-0 -350	-0 -400	-0 -460	-0 -520	-0 -570
<b>j5</b>	+3 -2	+4 -2	+5 -3	+5 -4	+6 -5	+6 -7	+6 -9	+7 -11	+7 -13	+7 -16	+7 -18
<b>j6</b>	+6 -2	+7 -2	+8 -3	+9 -4	+11 -5	+12 -7	+13 -9	+14 -11	+16 -13	+16 -16	+18 -18
<b>j7</b>	+8 -4	+10 -5	+12 -6	+13 -8	+15 -10	+18 -12	+20 -15	+22 -18	+25 -21	+26 -26	+29 -28
<b>js5</b>	+2.5 -2.5	+3 -3	+4 -4	+4.5 -4.5	+5.5 -5.5	+6.5 -6.5	+7.5 -7.5	+9 -9	+10 -10	+11.5 -11.5	+12.5 -12.5
<b>js6</b>	+4 -4	+4.5 -4.5	+5.5 -5.5	+6.5 -6.5	+8 -8	+9.5 -9.5	+11 -11	+12.5 -12.5	+14.5 -14.5	+16 -16	+18 -18
<b>js7</b>	+6 -6	+7.5 -7.5	+9 -9	+10.5 -10.5	+12.5 -12.5	+15 -15	+17.5 -17.5	+20 -20	+23 -23	+26 -26	+28.5 -28.5
<b>k5</b>	+6 +1	+7 +1	+9 +1	+11 +2	+13 +2	+15 +2	+18 +3	+21 +3	+24 +4	+27 +4	+29 +4
<b>k6</b>	+9 +1	+10 +1	+12 +1	+15 +2	+18 +2	+21 +2	+25 +3	+28 +3	+33 +4	+36 +4	+40 +4
<b>k7</b>	+13 +1	+16 +1	+19 +1	+23 +2	+27 +2	+32 +2	+38 +3	+43 +3	+50 +4	+56 +4	+61 +4
<b>m5</b>	+9 +4	+12 +6	+15 +7	+17 +8	+20 +9	+24 +11	+28 +13	+33 +15	+37 +17	+43 +20	+46 +21
<b>m6</b>	+12 +4	+15 +6	+18 +7	+21 +8	+25 +9	+30 +11	+35 +13	+40 +15	+46 +17	+52 +20	+57 +21
<b>m7</b>	+16 +4	+21 +6	+25 +7	+29 +8	+34 +9	+41 +11	+48 +13	+55 +15	+63 +17	+72 +20	+78 +21
<b>n5</b>	+13 +8	+16 +10	+20 +12	+24 +15	+28 +17	+33 +20	+38 +23	+45 +27	+51 +31	+57 +34	+62 +37
<b>n6</b>	+16 +8	+19 +10	+23 +12	+28 +15	+33 +17	+39 +20	+45 +23	+52 +27	+60 +31	+66 +34	+73 +37
<b>n7</b>	+20 +8	+25 +10	+30 +12	+36 +15	+42 +17	+50 +20	+58 +23	+67 +27	+77 +31	+86 +34	+94 +37

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<b>p5</b>	+17 +12	+21 +15	+26 +18	+31 +22	+37 +26	+45 +32	+52 +37	+61 +43	+70 +50	+79 +56	+87 +62								
<b>p6</b>	+20 +12	+24 +15	+29 +18	+35 +22	+42 +26	+51 +32	+59 +37	+68 +43	+79 +50	+88 +56	+98 +62								
<b>r6</b>	+23 +15	+28 +19	+34 +23	+41 +28	+50 +34	+60 +41	+62 +43	+73 +51	+76 +54	+88 +63	+90 +65	+93 +68	+106 +77	+109 +80	+113 +84	+126 +94	+130 +98	+144 +108	+150 +114

**END OF SUPPLEMENTARY SHEETS AND TABLES**

**END OF PAPER**

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